

10/-

A
Rational Account
OF THE
WEATHER.

Imprimatur,

ROB. SHIPPEN

Feb. 11,
1722.

Vice-Canc. OXON.

R

The
a
P

Not
b
A
a
a

The

T

By
S
o

Print

1.
116224
A
RATIONAL ACCOUNT
OF THE
WEATHER.

25
SHEWING

The SIGNS of its several CHANGES
and ALTERATIONS, together with the
Philosophical REASONS of them.

COLLECTED,

Not only from Common OBSERVATIONS,
but chiefly from some of the most Approved
AUTHORS, the most Celebrated PHILOSOPHERS,
and the most Judicious NATURALISTS of this
and former Ages.

The SECOND EDITION corrected and much enlarg'd.

To which are added,

Three ESSAYS towards accounting for

- I. A continued Course of Wet Years.
- II. The Cause of an *Aurora Borealis*.
- III. The Cause of the Plague.

*Ipse PATER statuit, quid menstrua Luna moneret,
Quo Signo caderent Austri, &c. VIRGIL.*

By JOHN POINTER, M. A. Rector of
Slapton, in the County of *Northampton*, and Diocese
of *Peterborough*.

L O N D O N:

Printed for AARON WARD, at the *King's Arms* in
Little-Britain. M DCC XXXVIII.

Л. Е. А. В.



T H E
P R E F A C E.



AIR (or the different Temperature of it, by which we mean WEATHER) is one of the grand Concerns of Mankind. 'Tis what affects all Sorts of People, Young as well as Old, Sick as well as Strong. Insomuch that even those very Persons that for want of Health are confin'd in close Rooms, feel either the Good or Ill Effects of the Weather: The Air being like Food, the better, the more refreshing. Hence it is that the Sick Man is inquisitive what Weather it will be; and the Healthful, when he is to take a Journey, is willing to consult his Weather-Glass. And even those of the Fair Sex, are unwilling to stir abroad unless the Weather be like themselves, and they like the Weather. How glad wou'd each Man be,

A

in

iv The P R E F A C E.

in his particular State and Condition of Life, either to be ensur'd of Good Weather, or foretold of Bad? How glad wou'd the Countryman be, to be assur'd of Good Weather to sow or reap his Corn and Hay? How glad wou'd the Traveller be, if he cou'd depend upon the Weather for such a determinate Time?

*To this End how frequently have Philosophers endeavour'd to make Schemes and Calculations of the Weather? And how, even to this Day, do your Astrologers and Philomaths pretend (tho' in vain) to their High Flights of Knowledge in their Prognostication of the Weather, from I know not what various Motions and Aspects, Trines, Squares, Sextiles, Conjunctions and Oppositions of the Planets with the Constellations, and with one another, and such like Astrological Cant and Jargon, which they are Annually troubling the World with, and with which glittering Starry Notions they are perpetually dazzling and deceiving the Eyes and Ears of the Unthinking Vulgar, who have neither Opportunities nor Abilities of examining or enquiring into the Reasons of Things. But how prettily soever these Men may talk of their Planets and Stars (for I know no Difference
between*

The P R E F A C E. v

between them as to their Composition) and however Solac'd and Jovial, Martial and Mercurial they may be at some times, yet doubtless they must take their Turn to be either Saturnine, Venereal, or Lunatic at other times, if (as they say) Astra regunt Homines (tho' others say, Sapiens dominabitur Astris). But be that as it will, Semel infanivimus omnes, especially when Men have been Talking out of their Sphere. However these Sciologists may value themselves upon their Planetary or Starry Knowledge, yet what Influence can such Distant Orbs shed upon Ours, so as to afford us any Rational or even Probable Conjectures in relation to the Weather? If they cou'd, we had long before this Time had certain and infallible Schemes of the Weather deliver'd down to us, from the Experience of some of the best Astronomers, that have for many Years together, and with the utmost Exactness, kept their Diaries, and made their strictest Observations upon the Conjunctions and Oppositions of the Planets. Yet, after all, how often has it been observ'd, that the very same Aspect of the very same Planets has predicted such a sort of Weather at one Time, and the quite Contrary another?

vi The PREFACE.

Indeed it must be granted that the Sun and Moon have Influence upon us, by reason of their Proximity; but as to the other Orbs (tho' all within the Verge of our Planetary System) they are notwithstanding in this respect Strangers to us, and the Stars far greater. And when we guess at the ensuing Weather from the Stars, 'tis only because, by getting a clearer or obscurer Sight of the Stars, we thereby discover the Clearness or Density of our Atmosphere, and so accordingly Prognosticate the Change and Alteration, or Continuance of Weather.

Therefore I think we need go no farther than this our Sublunary World, for the most probable and rational Conjectures in relation to the Weather, and deduce our Prognostications from the Animals and Vegetables of this our Terrene Globe, which is compos'd of Land, Water, and Air or Atmosphere: The Surface of which Earth is large enough, being 199444201 Miles, and the Solid Content of Air (according to the most Modern Calculation) 2341464949 Cubic Miles. The Distance of the Moon from the Earth 234304 English Miles; and the Distance of the Sun from the Earth 6485200 Miles; and the Distance

The P R E F A C E. vii

Distance of the other Planets, in this our Solar System, proportionably far greater.

And besides all this, there are several Ingenious Instruments invented, and improv'd, as Barometers, Hygrometers, Thermometers, &c. by which Men of Ordinary Capacities may pretty easily Prognosticate the Temperature of the Air, and consequently the several Changes and Alterations of Weather. For Natural Causes do Naturally (i. e. according to the settled Order and Nature of things) produce Natural Effects, as a Dry Air (i. e. Air free from Vapours) will Naturally produce Fair Weather; and Humid Air, the Contrary, unless hinder'd by Winds or the like. The same may be said of all other Sorts of Weather, in respect of the several Degrees of Heat or Cold, Rarefaction or Condensation.

But not to insist too much upon Generals, it may perhaps be thought improper to descend to Particulars, and give a short but Physical Account of the different Phenomena of the Weather, together with the Original of Clouds, Rain, Hail, Winds, &c. which may help to give Light to the Prognostications of the Weather, which I shall give you in the ensuing Discourse. In which Natural
Account

viii The PREFACE.

Account of the several Sorts of Weather, I shall not altogether adhere to my own Opinion, but give you the Opinions of the most celebrated Virtuoso's, and more especially of that excellent Naturalist the Reverend and Ingenious Mr. DERHAM, F. R. S. in his Physico-Theology.

And first, concerning Clouds and Rain. Clouds and Rain (says he) are made of Vapours rais'd from Water or Moisture only. (So that he utterly excludes the Notion of Dry, Terrene Exhalations or Fumes; Fumes being really no other than the Humid Parts of Bodies respectively Dry). These Vapours are demonstratively no other than small Bubbles or Vesiculæ detach'd from the Waters by the Power of the Solar, or Subterraneous Heat, or Both. And being lighter than the Atmosphere, are buoy'd up thereby, till they become of an equal Weight therewith, in some of its Regions aloft in the Air, or nearer the Earth; in which those Vapours are form'd into Clouds, Rain, Snow, Hail, Lightning, Dew, Mists, and other Meteors.

In this Formation of Meteors, the grand Agent is Cold, which commonly, if not always, occupies the superior Regions of the Air; as
is

The PREFACE. ix

is manifest from those Mountains which exalt their lofty Tops into the Middle and Upper Regions, and are always cover'd with Snow and Ice.

This Cold, if it approaches near the Earth, presently precipitates the Vapours, either into Dews; or if the Vapours more copiously ascend, and soon meet the Cold, they are then condens'd into Mistling, or else into Showers of small Rain, falling in numerous, thick, small Drops: But if those Vapours are not only Copious, but also as Heavy as our Lower Air it self (by means of their Bladders being thick and fuller of Water), in this case they become visible, swim but a little Height above the Earth, and make what we call a Mist or Fog. But if they are a Degree lighter, so as to mount Higher, but not any great Height, as also meet not with Cold enough to condense them, nor Wind to dissipate them, they then form an heavy, thick, dark Sky, lasting for several Weeks without either Sun or Rain. And in this case, I have scarce ever known it to rain, till it has been first Fair, and then Foul, be the Wind where it will. And from what has been said, the Case is easily accounted for, viz. whilst the Vapours remain in the same State,
the

x The P R E F A C E.

the Weather does so too. And such Weather is generally attended with moderate Warmth, and with little or no Wind to disturb the Vapours, and an heavy Atmosphere to support them, the Barometer being commonly High then. But when the Cold approaches, and, by condensing, drives the Vapours into Clouds or Drops, then is Way made for the Sunbeams, till the same Vapours, being by further Condensation, form'd into Rain, fall in Drops.

The Cold's approaching, the Vapours, and consequently the Alteration of such Dark Weather, I have before-hand perceiv'd by some few Drops of Rain, Hail, or Snow, now and then falling, before any Alteration has been in the Weather; which I take to be from the Cold meeting some of the straggling Vapours, or the uppermost of them, and condensing them into Drops, before it arrives unto, and exerts itself upon the main Body of Vapours below.

I have (says Mr. DERHAM) more largely insisted upon this Part of the Weather, because it gives Light to many other Phænomena of the Weather. Particularly we may hence discover the Origin of Clouds, Rain, Hail,

The P R E F A C E. xi

Hail, and Snow ; that they are Vapours carried aloft by the Gravity of the Air, which meeting together so as to make a Fog above, they thereby form a Cloud : If the Cold condenses them into Drops, they then fall in Rain if the Cold be not intense enough to freeze them : But if the Cold freezes them in the Clouds, or in their Fall thro' the Air, they then become Hail or Snow.

As to Lightning, and other enkindled Vapours, I only observe, That they owe also their Rise to Vapours ; but such Vapours as are detach'd from Mineral Juices, or at least that are mingled with them, and are fir'd by Fermentation.

Another Phænomenon resolvable from what has been said is, Why a Cold is always a Wet Summer, viz. because the Vapours rising plentifully then, are by the Cold soon collected into Rain.

We may observe farther, That about the Æquinoxes we have oftentimes more Rain, than at other Seasons. The Reason of which is manifest, because in Spring, when the Earth and Waters are loos'd from the Brumal Constipations, the Vapours arise in great Plenty : And the like they do in Autumn,

B

when

xii The P R E F A C E.

when the Summer Heats, that both dissipated them, and warm'd the Superior Regions, are abated; and then the Cold of the Superior Regions meeting them, condenses them into Showers of Rain, more plentiful than at other Seasons, when either the Vapours are fewer, or the Cold, that is to condense them, is less.

The Manner how Vapours are precipitated by the Cold, or reduc'd into Drops, I conceive to be thus; Vapours being no other than inflated Vesiculæ of Water, when they meet with a Colder Air than what is contain'd in them, the contain'd Air is reduc'd into a lesser Space, and the Watery Shell or Case, render'd thicker by that means, so as to become heavier than the Air, by which they are buoy'd up, and consequently must needs fall down. Also many of those thicken'd Vesiculæ run into One, and so form Drops, greater or smaller, according to the Quantity of Vapours collected together. Concerning which the Learned and Ingenious Dr. HALLEY has given us some curious Experiments, in the Philos. Transf. which may be met with together in Mr. LOWTHORP's Abridg. Vol. II. p. 108, and 126. Mr. SEDILEAU also at Paris observ'd

The P R E F A C E. xiii

serv'd it for near three Years : By whose Observations it appears, that what is rais'd in Vapours, exceeds that which falls in Rain. And by their Observations it appears, that in the Winter Months the Evaporations are least; and greatest in Summer, and most of all in Windy Weather. Vid. Mem. de Math. Phys. Ann. 1692. p. 25.

If it be demanded, what becomes of the Overplus of Exhalations that descend not in Rain ? I answer, they are partly tumbled down and spent by the Winds, and partly descend in Dews, which amount to a greater Quantity than is commonly imagin'd. Dr. HALLEY found the Descent of Vapours in Dews, so prodigious at St. Helena, that he makes no doubt to attribute the Origin of Fountains thereunto. And I my self (says Mr. DERHAM) have seen in a still, cool Evening, large thick Clouds hanging without any Motion in the Air, which in two or three Hours time have been melted down by degrees, by the Cold of the Evening, so that not any of the least Remains of them have been left.

Concerning Winds ; Ventus est Aer fluens, according to SENECA ; and Aer agi-

xiv The PREFACE.

tatus, according to ARISTOTLE. *And as Wind is a Current of the Air, so (says Mr. DERHAM) that which excites or alters its Currents, may be justly said to be the Cause of the Winds. An Æquipoise of the Atmosphere produces a Calm; but if that Æquipoise be more or less taken off, a Stream of Air, or Wind, is thereby accordingly produc'd either Stronger or Weaker, Swifter or Slower. And divers things there are that may make such Alterations in the Æquipoise or Balance of the Atmosphere, viz. Eruptions of Vapours from Sea or Land; Rarefactions and Condensations in one Place more than in another; the Falling of Rain, Pressure of the Clouds, &c.* HIPPOCRATES (*Lib. II. de Vi&et. Orat.*) *Omnes Ventos vel à Nive, Glacie, vehementi Gelu, Fluminibus, &c. Spirare necesse judicat.* BARTHOLIN. *De usu Nivis, c. I.*

PLINY (*L. II. c. 45.*) tells us of a certain Cavern in Dalmatia call'd Senta, In quem (*says he*) dejecto levi pondere, quamvis tranquillo die, turbini similis emicat Procella. *But as to Caves it is observ'd, that they often emit Winds more or less.* Dr. CONNOR taking notice of this Matter, specifies

The PREFACE. xv

specifies these, In Regno Neapolitano ex immani Sybillæ Cumanæ antro tenuem Ventum effluentem percepi. The like he observ'd at the Caves at Baiæ, and in some of the Mines in Germany, and in the large Salt-mines of Cracow in Poland. Ubi (says he) opifices, & ipse fodinæ Dominus Andreas Morstin, nobilis Polonus, mihi asseruerunt, quod tanta aliquando Ventorum Tempestas ex ambagiosis hujus Fodinæ recessibus surgere solebat, quod laborantes Fossore humi prosternebat, nec non Portas & Domicilia (quæ sibi in hac Fodinâ Artifices extruunt) penitus evertebat. BERN. CONNOR. Dissert. Med. Physf. p. 33. Artic. 3.

And as great Caves, so great Lakes sometimes send forth Winds. So GASSENDUS says the Lacus Legnius does, è quo dum exoritur Fumus, Nubes haud dubiè creanda est, quæ sit brevi in Tempestatem sævissimam exoneranda. GASSEND. Vit. Peiresk. L. v. p. 417.

*But the most universal and constant Alterations of the Balance of the Atmosphere, are from Heat and Cold. This is manifest in the general Trade-Winds, blowing all the Year between the Tropicks from East to West: If
the*

xvi The PREFACE.

the Cause thereof be (as some Ingenious Men imagine) the Sun's daily Progress round that Part of the Globe, and by his Heat rarefying one Part of the Air, whilst the cooler and heavier Air behind presses after. So the Sea and Land Breezes; and so in our Climate, the Northerly and Southerly Winds (commonly esteem'd the Causes of Cold and Warm Weather) are really the Effects of the Coldness or Warmth of the Atmosphere. Of which (says Mr. DERHAM) I have had so many Confirmations, that I make no doubt of it. As for Instance, it is uncommon to see a Warm Southerly Wind, suddenly chang'd to the North, by the Fall of Snow or Hail; to see the Wind in a Cold Frosty Morning North, and when the Sun has well warm'd the Earth and Air; you may observe it to wheel about towards the Southerly Quarters; and again to turn Northerly or Easterly in the cold Evening. It is from hence also, that in Thunder-Showers, the Wind and Clouds are oftentimes contrary to one another (especially if Hail falls), the Sultry Weather below directing the Wind one way, and the Cold above, the Clouds another way. I took notice (says Mr. DERHAM) upon Mar. 10.

The P R E F A C E. xvii

1711. (and divers other such like Instances I have had before and since) that the Morning was Warm, and what Wind stir'd, was West South-West, but the Clouds were Thick and Black (as generally they are when Snow ensues). A little before Noon the Wind veer'd about to North-by-West, and sometimes to other Points, the Clouds at the same time flying some North-by-West, some South-West. About One o'Clock it rain'd a-pace, the Clouds flying sometimes North-East, then North, and at last both Wind and Clouds settled North-by-West: at which time Sleet fell plentifully, and it grew very Cold. From all which I observe, First, that tho' our Region below was Warm, the Region of the Clouds was Cold, as the black Snowy Clouds shew'd. Secondly, that the Struggle between the Warmth of Ours, and the Cold of the Cloudy Region, stop'd the Airy Currents of both Regions. Thirdly, That the Falling of the Snow thro' Our Warmer Air melted into Rain at first, but it became Sleet after the Superior Cold had conquer'd the Inferior Warmth. Fourthly, That as that Cold prevail'd by degrees, so by degrees it wheel'd about,

xviii The P R E F A C E.

about, both the Winds and Clouds, from the Northwards towards the South.

Mr. ANN ELY (in his Theory of the Winds) gives us the Physical Causes of all Winds in General. He reckons that the Aqueous Vapours that are sustain'd by the Air (from whence come Clouds and Rain) may be the Foundation of Winds. It is not at all improbable (says he) that there is often assembled in the Atmosphere, a sufficient Quantity of Vapours to maintain a lasting Condensation, and that it is quick enough at some times to create a great Wind. For some Rains we are accusom'd to, are sufficient to make a small Motion of the Air, were the Vapours to Condense no faster than the absolv'd Particles discharge themselves by that means; but it seems very evident to be much faster; for when any Part of the Congregated Body of Vapours arrives to a State of Coldness fit to Condense them, it will be suppos'd the Condensation does quickly spread it self throughout the whole Misty Region — These Vapours may be retain'd in the Air some time after their Condensation. Which seems confirm'd by Observation: for we may ascribe to these unprecipitated Atoms of Water which proceed
from

The P R E F A C E. xix

from Vapours, the Humidity of the Air, and that very Moist and Thick Weather that we sometimes have, when the floating Atoms roving up and down by the Agitation of the Air, alight on our Walls, Floors, Windows, and such like Places; which we find very frequently in the Winter Seasons, especially in the Night-time; for the extraordinary Cold thereof does in a great measure condense those Vapours that are rais'd by the Sun and Wind in the preceding Day, which for want of Time, or by the Resistance of the Cold Air, are prevented from rising High; wherefore we see the Glass of Windows cover'd by Mists, at least on the Insides, for the Wind dries the Outside as fast as they gather.

But the Condens'd Vapours are very copious on the Tops of High Hills and Mountains, which extend themselves to the Clouds, or to the Regions where the Vapours exhal'd from the Earth do chiefly reside.

Since therefore we are not to compute the Condensation of Vapours by any Rain that falls, but may believe they can be condens'd quick enough to cause a Wind of any Intensity; we are next to enquire, Whether the Earth does not supply the Atmosphere with sufficient Quan-

C

tities

xx The P R E F A C E.

tities of Vapours to account for All the Winds throughout the World ?

This will not appear a Difficulty, if we attentively consider the Quantities emptied in Rain, Snow, Hail, &c. and that a great Part of the Aqueous Load of the Atmosphere is never precipitated this way, but spent in a sort of Dew before the Condens'd Mists or Clouds are prepar'd for Rain, or any other Precipitation, which is receiv'd in so great measure by High Land and Ridges, that Dr. HALLEY ascribes it to the Rise of Springs, of great Currents, the Repletion of Seas, &c.

By the Estimation Dr. HALLEY has given us of the Vapours rais'd by the Heat of the Sun, we shall find an immense Quantity is constantly remitted from the Earth to the Atmosphere. No less than 129,796,219 Cubical Miles of the Atmosphere are fill'd by Vapours every Day.

*This prodigious Quantity being divided and aranged in Bodies at various Stations throughout the World, occasions, by the mutual Condensations, almost constant Results of the Air to supply the empty Places; and I believe it will be thought abundantly sufficient for producing
and*

The PREFACE. xxi

and maintaining all Winds universally, especially if we consider with Dr. HALLEY, what unknown Quantities of Vapours are rais'd by the Winds, and likewise, that the great and variable Winds do not extend all over the World.

Thus far have we treated of what relates to the Condensation of Vapours; but it will be suppos'd that upon the same Hypothesis, their Accession to the Atmosphere will also cause a Motion therein, by driving the Air from the Place they occupy. Herein are we to observe, that Evaporations of the Earth are unbounded throughout the Hemisphere next the Sun, and what Vapours occur to any one Place, do every where resist the Incursion of the ampulated Air from the neighbouring Place; and tho' the Earth does more profusely emit its Vapours where it is in the Vertical Heat of the Sun, yet the Air by the greater Heat there, is more rarify'd, whereby it makes room for admitting a greater Quantity of Vapours; and so if we proceed from the Zenith to the Horizon, we shall find, that as the Emission of Vapours decreases according to the Heat of the Sun, it supplies the Rarification which decreases in the same manner. Thus the Air of that Side

xxii The P R E F A C E.

of the Earth towards the Sun, is oppos'd from flowing in on the contrary Hemisphere, by the augmented Resistance the latter receives by being condens'd by the Cold of the Sun's Absence.

But considering how great the Expansion of Vapours is, and that they are emitted incessantly, we may believe they do more than balance the Rarification made by the Sun's Heat, and swelling the Atmosphere occasions a Motion to the attenuated Parts, and has frequent Recourses to Land, which produces less Vapours; whence 'tis likely those Breezes come that we call Sea and Land Breezes.

Thus we see the Production of Winds depends chiefly on the Condensation of Vapours. Which Opinion agrees exactly with that of ARISTOTLE's, Rarefactio Aeris est Causa Ventorum.

To this Opinion of Mr. ANNELY's of the Winds, I shall add that of Mr. SAUL's, in his excellent Account of the Barometer, p. 82. The Temperate Zones (says he) being by their Situation liable to different Degrees and frequent Vicissitudes of Heat and Cold, are by Experience found to be the chief and only Seat of the variable Winds: Whereas in the Torrid and Frigid Zones, the Degrees of
Heat

The P R E F A C E. xxiii

Heat and Cold being more equal, constant and regular, the Winds blowing within their respective Limits are so too.

By the daily Revolution of the Earth upon its own Axis, the Air within the Tropicks passing daily under the Meridian Heat of the Sun, is to a great Degree rarify'd and attenuated by it : In the Consequence of which, the more Cool and Heavy Air pressing in to preserve the Balance ; and following the apparent Motion of the Sun towards the West, causes a general East-Wind to blow round the Globe on each Side of the Æquator ; which being at all Seasons of the Year nearly equal and constant, can produce little Alteration in the Weight of the Air.

The very same Effect equally follows from the intense and settled Coldness of the Polar Regions, whereby the Air above is to such a Degree condens'd and continued in a State of Density, as even to resist the Impression of the Winds. And agreeably to this Purpose Mr. BOYLE (from the Voyages to Greenland, &c.) remarks, That when any of the Mountains of Ice in those Northern Climates are loosen'd from their Foundations, and sail with the Current from the Polar Regions toward the Tropick,

xxiv **The P R E F A C E.**

Tropick, they are generally follow'd with a strong North or Easterly Wind, driving them forward ; and as some of these Mountains are describ'd by Travellers, as rising in Height and sinking in Depth from 50 to 140 Fathoms, and extending in Bulk and Circumference several Miles : it is certain that such a prodigious Accretion of Snow and Ice (advancing still with its broad Basis out of the Ocean, in proportion as the Upper Parts melt and dissolve) must be attended with very great and sensible Effects upon the Air and Vapours of Warmer Climates ; and often cause those unseasonable Bleak Winds, and Storms of Hail in the Summer-Months, which some Philosophers have with Reason ascrib'd to them.

*I shall conclude this Preface with a Caution to my Readers ; and that is, not to look upon these Signs and Indications of Good or Bad Weather (which I am going to give 'em) as always sure and certain, but only as, for the most part, probable and conjectural. For tho' when most Animals are more or less Heavy and Dull, the Air is so too, as being clogg'd with Vapours, that are a hindrance to Perspiration ; yet we find that Rain does not
always*

The P R E F A C E. xxv

always (tho' it does often) follow : Nay, tho' when we plainly see that the Air is Humid and Moist, and several Solid Bodies Humid and Moist at the same time, and that these are almost infallible Signs of Wet Weather, yet Rain is not always the Consequence of them. So on the contrary, when the Air is clear and serene, and most Animals more or less Brisk and Airy, the Clear Air invigorating their Blood and refreshing their Spirits, yet a Fair Season is not always a Natural Consequence of all this, tho' it wou'd be so, unless hinder'd by other Causes. The Reason of all which, is the Uncertainty of the General State and Quality of the Atmosphere. And (as Mr. SAUL well observes in his excellent Account of the Barometer, p. 74.) no Regular or Certain Judgment can be form'd of the General State and Quality of the Atmosphere, without taking in the full Extent of it ; because the Upper Regions of the Air may be very different from the Lower in their Effects and Indications ; nor can any Change of the Weather be lasting, where there is not a suitable Tendency in the whole Atmosphere to support and confirm it.

And

xxvi The PREFACE.

And upon this Account, the Weight of the whole Atmosphere runs thro' the whole Extent of it ; and is in truth, the chief Property concern'd, as well in supporting the Clouds and Vapours, as in giving way, upon any Abatement, to their Descent in Rain.

If therefore we suppose (as it sometimes happens) the Lower Region of the Air to be Humid, when all Above has a Tendency to be Fair and Dry ; or the Lower Region to be Dry when all Above has a Tendency to Wet Weather : It is certain, that no Conjecture, taken from Part of the Atmosphere, can be so well grounded, as what is deriv'd from the more general and prevailing Quality of the Whole.

Not that even in this latter Case we can form any certain Judgment of a Thing so mutable as the succeeding State of the Weather : Because the sudden Changes and Oppositions of the Winds, and Confusions in the Streams of the Air, and Vapours driving Above, are usually attended with Changes equally sudden and irregular in the Temper and Quality of the Air.

THE CON-



THE CONTENTS.

1. SIGNS of Rainy Weather from Animals. First from Birds,	Page 25
2. From Beasts	30
3. From Fishes,	32
4. From Insects,	35
5. From Men,	40
6. From Solid Bodies,	41
7. From Lakes,	44
8. Signs of Wet or Fair Weather from the Disposition of the Atmosphere,	46
9. Signs of Rain from the Planets and Stars. First from the Sun,	47
10. From the Moon,	53
11. From the Stars,	57
12. From the Clouds,	ibid.
13. From the Rain-bow,	61
14. Signs of Rain ceasing,	65
15. Signs of the Weather from Mists,	66
16. From Vegetables,	68
17. Signs of Fair Weather. First from the Sun,	71
18. From the Moon and Stars,	72
19. From the Clouds,	73
20. From Insects,	74
* D	
21. From	

CONTENTS.

21. <i>From Birds,</i>	Page 77
22. <i>Signs from Fishes,</i>	81
23. <i>Signs of the Weather from the Winds,</i>	ib.
24. <i>Signs of Windy and Wet Weather from the Sun,</i>	88
25. <i>From the Moon,</i>	ibid.
26. <i>Signs of the Winds changing,</i>	91
27. <i>Of Tempests arising,</i>	92
28. <i>Signs of arising Tempests from the Sun, Moon, and Stars,</i>	98
29. <i>From the Clouds and Sea,</i>	100
30. <i>Signs of Tempests Ceasing,</i>	102
31. <i>Of Thunder and Lightning,</i>	ibid.
32. <i>Of Hail,</i>	108
33. <i>Of Cold, and Frosty, Weather,</i>	113
34. <i>Of Hard Winters,</i>	115
35. <i>Of Pestilential Seasons,</i>	121
36. <i>Of Scarcity and Dearth,</i>	135
37. <i>Of Continuance of Weather,</i>	139
38. <i>Signs of the Weather from the Weather- glasses,</i>	140

Three ESSAYS.

1. <i>On a continued Course of Wet Years,</i>	162
2. <i>On the Cause of an Aurora Borealis,</i>	170
3. <i>On the Cause of the Plague,</i>	204

A RATIONAL



A
RATIONAL ACCOUNT
OF THE
WEATHER, &c.

Signs of Rainy Weather from Animals.
First from BIRDS.

CREATURES that live in the Open Air, must needs be suppos'd to have quicker Sense of it, than Men that live more within Doors, especially BIRDS that live in the Air that is Purest and Clearest, and are apter by their Voices, and Flights, and other Motions, to discover their Sensations of it. Therefore those that have apply'd themselves to the Observation of the Signs and Prognostications of Good or Bad *Weather*, have laid down these following Rules :

D *Water-*

26 *Signs of Rain from Birds.*

Water-Fowls (says that excellent Naturalist my Lord BACON, in his *Nat. Hist.* Cent. 9.) such as *Sea-Gulls, Moor-Hens, &c.* when they flock and fly together from the Sea towards the Shoars, foretel *Rain* and *Wind*. Thus VIRGIL (in his *Georgics*, l. i.) enumerating the Signs of *Rain*,

Cum medio celeres revolant ex Æquore Mergi,
Clamoremq; ferunt ad Littora; cumq; Marinæ
In sicco ludunt *Fulicæ*; notasq; Paludes
Deseruit, atq; altum supra volat *Ardea* nubem.

i. e.

*When crying Cormorants forsake the Sea,
And stretching to the Covert wing their Way;
When sportful Coots run skimming o'er the Strand, &c.*

And contrariwise, *Land-Birds*, as *Crows, Swallows, &c.* when they fly from the Land to the Waters, and beat the Waters with their Wings, do likewise foretel *Rain* and *Wind*. Thus PLINY (in his *Nat. Hist.* lib. xviii. c. 79.)

Si *Corvi* carptim vocem reſorbebunt, Ventosum Imbrem præſagiunt. . . Et cum *Terreſtres Volucres* contra Aquam clangores dabunt, perfundentes ſeſe, ſed maximè *Cornix*. i. e.

*When Crows are clamorous they foretel a Storm:
And other Land-Fowl will be vociferous againſt Rain,
and beſprinkle themſelves, but eſpecially the Rook.*

And thus LUCAN, l. v. ver. 555.

Quodq; caput ſpargens undis, velut occupet Imbrem.
Inſtabili grefſu metitur littora *Cornix*:

i. e. *The*

Signs of Rain from Birds. 27

i. e.

The Rook sprinkles her Head with Water, as tho' she was actually enjoying the Shower, and walks about the Shoar in a restless Expectation of approaching Rain.

The Natural Reason of all which is the Pleasure, that both these Sorts of Birds take in the Humidity and Density of the Air, and so love to be in Motion and upon the Wing. For it is no wonder that *Water-Fowl* do delight most in that Air that is most like (their Natural Element) Water : And *Land-Fowl* also (many of them) take Pleasure in Bathing and Humid Air. For the same Reason likewise many *Birds* do prune their Feathers, and *Crows* do seem to call upon Rain, and *Geese* do gaggle : *Anseres* (says PLINY) *continuo clamore intempestivi* ; i. e. *Geese* are incessantly gagging and overjoy'd at the approaching Rain : All which is the Pleasure these *Birds* seem to take in the Relaxation of the Air. Vid. THEOPHRAST. *lib. de Signis Temp.* p. 124.

The *Heron*, being a *Water-Fowl* *, takes Pleasure in the Air that is condens'd ;

D 2

and

* I call it a *Water-Fowl* because it lives near the *Water* to catch *Fish*, tho' it does not swim in the *Water* ; as the *Halcyon* or *King-Fish*, is call'd a *Sea-Bird*, because it builds its Nest upon the *Shoar*.

28 *Signs of Rain from Birds.*

and besides, being but heavy of Wing, needs the Help of the grosser Air, and for this Reason flies low when the Air is full of Vapours, and thickens into Showers. Thus LUCAN, lib. v. ver. 553.

——— Quodq; ausa volare
Ardea Sublimis pennæ confisa natanti.

i. e.

*When watchful Herons leave their watry Stand,
And mounting upward, with erected Flight,
Gain on the Skies, and soar above the Sight.*

The *Crows* also flocking together in large Flights, holding their Heads upward as they fly, and crying louder than usual, is a Sign of *Rain*; as is likewise their stalking by Rivers and Ponds, and sprinkling themselves. Thus VIRGIL;

——— Et è pastu decedens agmine magno
Corvorum increpuit densis Exercitus alis.
Jam varias Pelagi *Volucres*, & quæ *Asia* circum
Dulcibus in Stagnis rimantur prata *Caistri*,
Certatim largos humeris infundere rores;
Nunc caput objectare Fretis, nunc currere in Undas,
Et studio in cassum videas gestire lavandi.
Tum *Cornix* plena *pluviam* vocat improba voce,
Et sola in sicca secum spatatur Arenâ.

i. e.

*Huge Flocks of rising Rooks forsake their Food,
And, crying, seek the Shelter of the Wood.
Besides the sev'ral Sorts of Watry-Fowls,
That swim the Seas, or haunt the standing Pools;*

The

Signs of Rain from Birds. 29

*The Swans that sail along to search their Food,
Then lave their Backs with sprinkling Dews in vain,
And stem the Stream to meet the promis'd Rain.
The Crow with clam'rous Cries the Show'r demands,
And single stalks along the Desert Sands.*

Thus likewise ARATUS :

*Agmine cum denso circumvolitare videtur
Graculus, & tenui cum stridunt gutture Corvi,
Convenit instantes prænoscere protinus Imbres.*

i. e.

*When Jack-Daws are observ'd to flock together in
large Flights, and Crows caw more eagerly, 'tis a Sign
of approaching Rain.*

Also the Chattering of *Swallows*, and
the flying low about Lakes and Ponds (which
they do to catch flies, for the Air being
clogg'd with Vapours, hinders the Ascent
of Flies) denotes *Rain*. Thus VIRGIL ;

Aut arguta Lacus circumvolitavit Hirundo.

i. e.

The Swallow skims the River's watry Face.

And hence PLINY, who had these
Hints from VIRGIL ;

*Hirundo tam juxta Aquam volitans, ut pennâ sæpè
percutiat.*

i. e.

*The Swallow flies so close upon the Superficies of the
Water, that he often strikes it with his Wing. See
THEOPHRAST. lib. de Signis Tempest. p. III.*

Other Signs of *Rainy Weather* from
Birds are, when *Peacocks* cry much :
When

30 *Signs of Rain from Beasts.*

When *Fowls* pick up their Feathers with their Bills : When *Birds* that usually perch upon Trees, fly to their Nests ; *Quæq; in Arboribus habitant, fugitantes in Nidis suis*, says PLINY : And when *Pigeons* return to their Dove-house : When *Cocks* crow before their usual Hour ; and *Hens* creep in Clusters into the Dust ; and *Owls* are clamorous ; *Noctua in imbre garrula*, says PLINY.

Signs of Rain from Beasts.

THERE are several Sorts of BEASTS likewise that foretel *Rain*. When *Sheep* leap mightily, and frisk about, and push at one another with their Heads : *Pecora exultantia, & indecora lascivia ludentia*, says PLINY.

When *Deer* fight : When *Asses* bray, or shake their Ears, and are much annoy'd with Flies : When *Foxes* bark, and *Wolves* howl mightily : So VIRGIL ;

Et altè
Per noctem resonare, *Lupis* ululantibus, *Urbes*.

When *Hogs* at Play break and scatter their Food—*Turpes Porci alienos sibi manipulos lacerantes*—says PLINY.

When

Signs of Rain from Beasts. 31

When *Cattle* leave off Feeding, and hasten to shelter under Hedges and Bushes, &c.

When *Cats* rub their Heads with their Fore-Paws (especially that Part of their Heads above their Ears) and lick their Bodies with their Tongues. The Reason of which is the Humidity of the Air incommoding their Bodies by clogging their Hair and obstructing their Pores. The very same Reason may be given for *Asses* braying, *Foxes* barking, and *Wolves* howling, &c.

Beasts do generally take Delight in a Wet Air, and it makes them eat their Meat the better : Because the Humidity of the Air helps to relax the Fibres of the Stomach, and open the Glandules which transmit an Acid Juice that creates an Appetite. Hence it is that *Sheep* will raise themselves betimes in the Morning to feed against *Rain* ; and *Cattle*, and *Deer*, and *Rabbits* will feed hard before Rain : Only *Heifers* and *Oxen* will put up their Noses and snuff in the Air against Rain. Thus VIRGIL ;

Bucula Coelum
Suspiciens patulis captavit naribus Auras.

i.e. *The*

32 *Signs of Rain from Fishes.*

i. e.

*The Cow looks up, and from afar can find
The Change of Heav'n, and snuffs it in the Wind.*

And hence PLINY ;

Et Bovæ Cælum olfactantes, seq; lambentes contra Pilum. i. e.

Oxen are sensible of the Alteration of the Weather, and are ever and anon snuffing and tossing up their Noses, and licking themselves against their Hair : Which they do to ease themselves by opening the Pores of their Skin, which before were clos'd by the Humidity of the Air.

Signs of Rain from Fishes.

FISHES in the Sea, or in Rivers, do often predict *Rain*, by their playing towards the Top of the Water. The Reason of which is this (says my Lord BACON) *Fishes* love to keep from the Air as much as they can when it is Dry, and swim lower, and will not approach the Air till it is Moist. Tho' I rather think 'tis for want of a sufficient Quantity of Internal Air in the Water, that the *Fishes* are forc'd to leap up now and then upon the Superficies of the Water to recruit themselves with a little fresh Air ; because the External Air being clogg'd with Vapours, is too weak to penetrate the Waters. For as *Fishes* cannot live by Water alone, but require a due Mixture
of

Signs of Rain from Fishes. 33

of Water and Air ; so neither can they live by Air alone, as is plain from *Fishes* soon dying when taken out of the Water, being then out of their Element. And that they cannot live without Air is evident from their dying in Rivers and Ponds when frozen up.

Now to give the Natural Reason for this, I cannot do it better than in the Words of the Ingenious Dr. CHAR. PRESTON (*Phil. Trans.* N^o 225. p. 419.) *Fish* (says he) are remarkably different from all other Animals in many Particulars. The most considerable Difference is in their want of *Lungs*, and their not *Breathing* ; and yet it is necessary that something should supply this in *Fishes*, which may have the same Effect upon their Blood, as the *Air* has upon Ours, by entring into our *Lungs*, that is to say, to Divide and Dissolve it, and render it fit for Circulation. Now we find no Part in *Fish* more proper to produce this Effect than the *Bronchiæ* that lie like so many Leaves upon each other under their *Gills* ; for they receive the *Water* in by the Mouth, and return it by the *Gills*, or receiving it in by the *Gills*, they
E throw

34 *Signs of Rain from Fishes.*

throw it out by the *Mouth*. Hence it is agreed upon by all that the *Water* contains something that produces this Effect, and this seems most probably to be *Air*.

That there is *Air* in all *Water* cannot be doubted after this Experiment of M. MAROLLE. He set a Vessel of *Water* over the *Fire*, so to drive out the *Water* from it. This *Water* he put into the *Air-Pump* to draw out the *Air* from it; and after that fill'd a Vial with it, within two or three Fingers of the Top, which Space he only left full of *Air*, and stop't the Vial well; and by shaking it the *Water* imbib'd the *Air*, so as to raise up and quite fill the Vial.

But we need not wonder that *Fish* cannot also live in the Open Air. Their Blood is Naturally less Hot than Ours, so that the Natural Heat of Ours wou'd be a Fever in them, and Mortal: For the *Nitre* of the pure *Air* is in too great a Quantity, and too subtile, so that it Dissolves their Blood too much, and makes it too *Fluid*; whereas the *Nitre* in the *Water* is more Gross and in lesser Proportion; whence it gives their Blood only a *Fluidity* requisite to keep it
in

Signs of Rain from Insects. 35

in its *Natural State*. To prove that it is in the *Bronchiæ* that this Division is perform'd, we need but observe their Extraordinary Redness above any other Part of the Body ; a Proof that the Blood is there more Divided. *Fish* are also found to die in *Water* frozen over, which happens plainly from their Communication with the *Outward Air* being hindred by the *Ice*.

Signs of Rain from Insects.

INSECTS also and *Reptiles* foretell Rain. *Vermes terreni erumpentes* — says PLINY : *Earth-worms* will creep out of the Ground ; and *Moles* will cast up more Earth ; and *Fleas* bite more against Rain ; and *Spiders* creep abroad ; and *Flies* are very troublesome, often dashing against a Man's Face. *Bees* do not stir (or at least not far) from their Hives. *Ants* quit their Labour, and hide themselves in the Ground : For these Provident *Insects*, by a secret Instinct of Nature, find the Air chang'd into Moistness, and clogg'd with Vapours, carry their Eggs to a Place of drier Security.

36 *Signs of Rain from Insects.*

Thus VIRGIL ;

Sæpius & tectis penetralibus extulit Ova
Angustum *Formica* terens iter——

i. e.

*The careful Ant her secret Cell forsakes,
And drags her Eggs along the narrow Tracts.*

Hence PLINY ;

Segnitè & contra industriam suam absconditæ
Formicæ, vel concursantes, aut Ova progerentes.

i. e.

*Frogs will croak in Ditches more than usually against
Rain, and Toads are heard to croak upon Eminences.*

Thus VIRGIL ;

Et veterem in limo *Ranæ* cecinere querelam.

i. e.

The Frogs renew the Croaks of their loquacious Race.

And ARATUS,

Si repetent veterem *Ranæ* per stagna querelam.

Hornets likewise and *Wasps* are Fore-tellers of the Weather. If they are seen flying together in greater Numbers than ordinary in an Evening, they foretel *Warm* and *Fair Weather* the next Day : But if in a dark and dull Day they are observ'd to betake themselves to their Nests more frequently for Shelter, you may then expect either *Rain, Wind, or Storms* the next Day. So MOUFET tells us (in his *Insectorum Theatrum*, p. 52.) His Words are,

——Cra-

Signs of Rain from Insects. 37

— *Crabones* rusticis *Tempestates* etiam prædicunt ; nam si *Vesper*i numerosiores circumvolitent quàm solebant, signum est *Caloris* & *Serenitatis* futuræ proximo die. Si verò luce creperâ sæpius intraverint *Nidos*, quasi sese occultaturi, *Pluviam*, *Ventos*, vel tempora *Procellosa*, exspecta.

Undè AVIENUS,

Sic & *Crabonum* rauca Agmina si volitare
Fine sub Autumni conspexeris, æthere longo,
Jam *Vespertinos* primos cum commovet Ortus
Vigiliis, pelago dices instare *Procellum*.

Gnats likewise foretel the Weather. For if they play up and down the open Air near the Sun-set (says MOUFET) they pre-
sage Heat : If in the Shade, warm and mild
Showers : But if they all of them together
sting those that pass by them, then expect
Cold Weather and very much *Rain*. His
Words are,

Si *Κνίτις* (i. e. *Culices*) divergente Sole colluserint
in aprico, *Calores* præfagiunt : Si in Umbrâ, *Pluvias*
tepidas & mites : Si verò unâ acriter præteriuñtes
pepugerint, frigidam *Tempestatem* & valdè *Pluviosam*
exspecta.

Now the best Natural Reason (in my
Opinion) that can be given why these
Little Animals call'd *Insects*, come to have
such quick and exquisite Sense of things,
is because their Organs of Sensation are
smaller. That excellent *French* Author
VERDUC,

38 *Signs of Rain from Insects.*

VERDUC, in his Treatise of the Parts of *Human Body*, pag. 244. gives us a very Curious Account of the Sensations of *Bees*. *Bees* (says he) perceive the Smells of Flowers at a great Distance; but to understand how they perceive it, there's the Difficulty. Mr. PERRAULT in his *Mechanism of Animals* (which is the most curious Treatise of all his Physical Essays) says that Bees, common Flies, and many other Insects, which have not only the Use of Smelling, but also Seeing and Hearing, yet have nothing but one Universal Sense, which is a very delicate Touch; for it being impossible that all the Objects of the different Senses should be known, without some particular Motion which may render them sensible, methinks (says this Learned Naturalist) that those Insects which are very small, must needs have those Particles which form the Organ of their Senses much smaller, whence the Organ is more easily shaken by the Motion of the Objects, let it be never so gentle or slight, and much otherwise than in Great Animals, where the Organ of Touching cannot be shaken without some considerable Motions.

The

Signs of Rain from Insects. 39

The Ancients, who tried many Experiments, and made many Observations on *Bees*, and every thing that belongs to them, could never believe that they heard the Sound of the Brass, tho' they follow'd it; even ARISTOTLE himself is of this Opinion. Supposing then that the *Insects* have a very fine delicate *Touch*, perhaps that may be equivalent to the Organ of Hearing in other Animals, that is to say, that the Shaking of the Air, which is not perceiv'd by the *Touch* of Great Animals, is proportion'd to that of *Insects*; so that to explain what appears to us of the Sense of these small Creatures, we may say that if the Exhalation or Vapour which arises from a Dead Beast, or from Honey or Sugar in a Box, is capable of touching a Fly or an Ant at so great a Distance; it is also the Vapour which comes from the Hand which draws the Fly thither.

From whence I conclude that the Coldness and Moisture of the Air affects these little *Insects* in such a manner as to admonish them to retire into Shelter; and by this means they predict *Rain*.

Signs

40 *Signs of Rain from Men.*

Signs of Rain from MEN.

EVEN in MEN, Aches, Wounds, and Corns are more troublesome, either towards *Rain*, or towards *Frost* : For the one makes the Humours of the Body to abound more, and the other makes them sharper : Both of which Extremes bring the Gout. The very Body of all *Animals* and *Vegetables*, is (as it were) a Contexture of Hygrometers, Barometers, and Thermometers ; for the Humours, with which the organiz'd Bodies are replenish'd, increase or decrease according to the different Dispositions of the Air.

A late ingenious Author (Mr. HANDLEY in his *Mechanical Essays* on the Animal OEconomy, p. 454, &c.) says, All the Changes that happen, either by Heat or Cold, to fermenting Liquors, are caus'd by the Alteration of either the Gravity or Spring of the Air ; and it is for the same Reason that some People by their *Pains* and *Aches* are so often Weather-wise : Their Blood being more rarify'd against *Wet* Weather or High *Winds*, will more forcibly press the sensible Membranes, whereby *Pains* will be felt which they felt not before.

If

Signs of Rain from Solid Bodies. 41

If the Air be too Hot, especially if Moist withal, it disposes the Body to Malignant Fevers; and if the Heat be excessive (tho' without Moisture) it produces Diary Fevers; and what the Ancients call'd *Putrid*. Perspiration being too great, the Humours must remain Viscid and Dry, and so unfit for Circulation.

The Air being fill'd with Vapours, its Elasticity is weaken'd, the Fibres of the Body are relax'd, and the Pores obstructed; which will make the Blood apt to dispose a slimy *Lentor* on the Sides of Capillary Arteries, and Orifices of the Glands, which will be apt to produce Agues; and more especially if Cold be added to the Moisture of the Air; for Cold binds up and makes the Blood more compact, whereby its Motion becomes slower, and its Viscidity greater, and so produces this Distemper.

Signs of Rain from Solid Bodies.

STONES (especially *Marble*) when they sweat (or rather seem to sweat) and *Boxes* and *Doors* (especially *Deal*) and *Pegs* of *Wood*, when they draw and

F

wind

42 *Signs of Rain from Solid Bodies.*

wind hard, are Signs of *Wet Weather*. Tho' the former be but from an Outward Cause, for that the *Stones* are so hard and solid as not to admit the Moisture of the Air, and therefore it only lies upon the Superficies of the *Stones*; the latter is an Inward Swelling of the Body of the *Wood* it self, caus'd by the Admission of the Air thro' its Pores. For the Air pressing upon the Aqueous Particles floating in it, forces them into the slender Tubes of the *Wood*, where they meet with no Resistance, the Particles of Air being too large to enter the same; from whence it appears that the Component Particles of Water, are less than those of Air.

M. *Ozanam* says the moist Vapours do readily insinuate into *Wood*, especially that which is light and dry, as being extremely Porous; insomuch that they are sometimes made use of for dilating and breaking the hardest Bodies, particularly Mill-stones; for when a Rock is cut into a Cylinder, they divide that into several lesser Cylinders, by making several Holes round the great Cylinder, at Distances proportional to the design'd Thickness of the Mill-stones;

Signs of Rain from Solid Bodies. 43

stones ; and filling them with as many Pieces of *Sallow Wood* dried in an Oven ; for when *Wet Weather* comes, these *Wedges* or Pieces of *Wood* are so impregnated with the moist *Corpuscula* of the Air, that they swell and break or separate the Cylindrical Rock into several Mill-stones.

The hardest and most solid *Wood* will swell by the Moisture of the Air ; as appears by the Difficulty of shutting our Doors and Windows in *Wet Weather*.

The Humidity of the Air insinuates it self not only into the *Wood*, but likewise into the *Hardest Bodies* which are not destitute of Pores, and especially into the Light Bodies which take up a great Space. And hence it is, that Mr. PASCHAL (in his Treatise of the *Æquilibrium of Liquors*) says, that if a Pair of Scales continues in *Æquilibrium* when loaded with two equal Weights, one of which is of a more Voluminous Substance than the other, as *Cotton* or any Body of a lesser Specific Gravity, the Balance will depart from its *Æquilibrium*, and incline to that more Voluminous Weight when the Air

44 *Signs of Rain from Lakes.*

is condens'd with Vapours : For the Watry Particles, with which the Air is loaded, will insinuate themselves more readily into this, than into the other Weight, which being less Voluminous, must needs have lesser Pores.

But of all the Bodies that are apt to imbibe the Moisture of the Air, I know of none more such than the *Salt* of any Hot Plant, or *Salt-petre* well calcin'd, which, upon the least Moisture of the Air, melts readily into Water, so as to weigh three or four times as much as before. For this is the Common Quality of almost all *Salts*, that they are easily impregnated with the Bodies contain'd in the Air ; and accordingly when the *Salt* at a Table is moister than ordinary, we take it for a certain Sign of approaching *Rain*, as denoting that the Air is loaded with Moist Vapours, which will quickly dissolve into *Rain*.

Signs of Rain from Lakes.

AT *Penford* in *Staffordshire* is a Lake that foretels *Rain*. Tho' it be a standing Lake, yet it is seldom dry, and toler-

Signs of Rain from Lakes. 45

tolerably clear in settled fair Weather; only against *Rain* it becomes troubled, rising full of Bubbles, and in a little Time thickening at the Top into a *yellow Scum*, which presently as it rains vanishes away, and the Water recovers again its former Colour and Clearness. All which has frequently been observ'd and found to be true by the Worthy Mr. FOWLER, an Inhabitant of the Place, who freely confess'd that he had often been admonish'd by it in Time of Harvest to fetch in his Corn, and at other Times made the same Use of it as we do of *Weather-glasses* or other *Hygrosopes*. The yellow Scum on the Superficies of the Water can be nothing else, in my Opinion, than Sulphureous Vapours, whose Ascent being hinder'd by the Pressure of the Watry Atmosphere at those Times, causes that Ebullition and Fermentation on the Top of the Water, which afterwards thickens into that yellow Scum. For the Water of all Lakes is more or less impregnated with a crude Sulphur, occasion'd by its Stagnation, which must needs emit contagious Vapours, insomuch that sometimes Birds have been suffocated by them in endeavouring to fly over them.

Signs

46 *Signs of Wet or Fair Weather.*

*Signs of Wet or Fair Weather from the
Disposition of the Atmosphere.*

THE Reverend and Ingenious Mr. SAUL (in his Hist. and Philos. Account of the *Barometer*) says, So long as the Air continues Heavy (being either condens'd or accumulated in Quantity) the Vapours will be sustain'd, and the Weather hold *Fair*: But if the Air by any Rarification or Diminution of its Quantity turns lighter, Vapours, which were before in *Æquilibrio* with it, will preponderate; and being heavier than the Air, in which they floated, will consequently descend. In their Descent, as they approach nearer to each other, and are continually check'd by the Resistance of the Air, they must be condens'd; and this Condensation of the falling Vapours will gradually encrease, till they are compress'd and collected into small Particles or *Globuli* of Water; and these again, incorporating with others in their farther Descent, are at last form'd into bigger Drops, and fall down in Showers of *Rain*; and these Showers will be more
or

L

Signs of Rain from the Planets. 47

or less violent, and the Drops larger or smaller, in proportion to the Quantity of the falling Vapours, and the Height from whence they descend. See the Beginning of this Book.

*Signs of Rain from the Planets and Stars :
First from the SUN.*

IF the SUN at his Rising looks Red, and Broader than usual, then many Moist Vapours are gathering from the Sea, the Air is thickning, and the *Sun-beams* diffus'd in it, makes the Face of that Planet shew greater than usual, and in a little Time you'll see the Clouds muster and spread the Face of the Heavens, and the Air condensing into a Watry Body : And if this happen in Hot Weather (*viz.* Summer or Autumn) violent *Showers* of *Rain* will fall, but not of long Continuance ; but if in Winter or Spring, settled *Rains*, but more moderate. Thus VIRGIL, *Georg. Lib. i.*

SOL quoque & Exoriens, & cum se condit in Undas,
Signa dabit : SOLEM certissima Signa sequuntur,
Et quæ Mane refert, & quæ Surgentibus ASTRIS,
Ille ubi Nascentem maculis variaverit Ortum

Concavus

48 *Signs of Rain from the Planets.*

Concavus in Nubem, medioque refugerit Orbe;
Suspecti tibi sint *Imbres*. Namque urguet ab Alto
Arboribusque satisque Notus Pecorique sinister.

i. e.

*Above the rest, the SUN, who never lies,
Foretels the Change of Weather in the Skies:
For if he Rise, unwilling to his Race,
Clouds on his Brow, and Spots upon his Face;
Or, if thro' Mists he shoots his sullen Beams,
Frugal of Light, in loose and straggling Streams,
Suspect a drizzling Day, with southern Rain,
Fatal to Fruits, and Flocks, and promis'd Grain.*

PLINY, *Nat. Hist.* L. xviii. c. 35.

SOL concavus Oriens *Pluvias* prædicit; idem *Ventos*,
cum antè Exorientem eum Nubes rubescunt. Quod
si & nigræ rubentibus intervenerint, & *Pluvias*. Cum
Orientis & Occidentis radii rubent, coire *Pluvias*.

i. e.

*When the SUN rises hollow (that is somewhat ob-
scur'd by Clouds, or hid in the Cavity of a Cloud) it
foretels Rain. When the Clouds look Reddish before the
Sun-rising, it foretels Wind: But if there be a Mix-
ture of Black Clouds with the Red, it foretels Rain.
When the Rays of the SUN look Red, either at its
Rising or Setting, it is a Sign of Rain.*

It has likewise been observ'd by those
that have had long Experience of the
Weather, That if the SUN Rises with a
Blewish Circle inclining to White, the Air
is gross and condens'd, and *Rain* will soon
follow.

Or

Signs of Rain from the Sun. 49

Or if the SUN rises Pale, and the Sky of a Dusk-Red in the Morning, an Over-casting will soon ensue, and *Rain* quickly follow upon it, attended with whistling Winds. Thus PLINY;

Si in Exortu SOLIS fiet ita ut rubescant Nubes, maxima ostendetur *Tempestas*. Si non ambibent, sed incumbent, à quocunque Vento fuerint, eam portentent;
i. e.

If the Clouds look Red at Sun-rise, there will be a very great Tempest. And they hang and not move about (from whatever Quarter they come) they portend the same.

Again, if the SUN rises in a misty, muddy Colour, and diffuses its Rays Palish towards the North and South, it denotes *Rain*. So PLINY;

Si in Exortu SOLIS spargentur Nubes partim ad *Austrum*, partim ad *Aquilonem*, pura circa eum Serenitas sit licet, *Pluviam* tamen *Ventosque* significabunt.
i. e.

If at SUN-Rising, the Clouds are dispers'd Northward and Southward, tho' the SUN shines never so clear, there will be Rain and Wind.

Ita FESTUS AVIENUS *De Sole*, p. 69.

Sed non ora Cavo similis, medioque recedens
Ore quasi, vel si radios discingitur ultro
Figat ut *Australem* porrecti Sidere partem,
Ac *Boream* rigidi jaculetur lliminis ignem,
Et *Vento & Pluviiis* reparata luce carebit.

G

And

50 *Signs of Rain from the Sun.*

And as for the SUN-SETTING, it has been observ'd by M. *Ozanam*, that if it Sets under a thick Cloud, there will be *Rain* next Day : Or if it rains immediately, there will be a great deal of *Wind* next Day ; which is almost the constant Consequence of a Pale-setting SUN. Thus
PLINY —

Si in Occasu SOLIS pluet, aut Radii in se Nubem trahent, asperam in proximum Diem Tempestatem significabunt.

M. OZANAM says, a Red Sky at SUN-rising is a Sign of *Rain* : But a Red Sky where the Sun sets, is a Sign of *Fair Weather*. Indeed if the Sky be Red at a great Distance from the Part where the SUN sets, as in the *East*, there will be either *Rain* or *Wind* the next Day.

When a thick white *Dew* lies upon the Ground in a Winter Morning, you'll have *Rain* the second or third Day after.

VIRGIL's Remarks on the Setting-SUN are these (*Georg. L. i.*) —

Hoc etiam, emenso cum jam decedet Olympo,
Profuerit meminisse magis. Nam sæpè videmus
Ipsus in vultu varios errare Colores.
Cæruleus Pluviam denunciat, *Igneus* Euros.
Sin maculæ incipient *Rutilo* immiscerier *Igni*,
Omnia tum paritèr *Vento* *Nimbisque* videbis
Fervere

i. e. But

Signs of Rain from the Sun. 51

i. e.

But more than all the SETTING-SUN survey,
When down the Steep of Heav'n he drives the Day.
For oft we find him finishing his Race
With various Colours erring on his Face ;
If fiery *Red* his glowing Globe descends,
High *Winds* and furious *Tempests* he portends ;
But if his Cheeks are swoln with livid *Blue*,
He bodes *Wet* Weather by his Watry Hue :
If *Dusky* Spots are vary'd on his Brow,
And, streak'd with *Red*, a troubl'd Colour show,
That sullen Mixture shall at once declare
Winds, *Rain*, and *Storms*, and Elemental War.

Another Sign of Rain is, when the
SUN seems to be divided.

Also a Misty and very Warm Air, after
SUN-Rising or Setting, especially in the
Spring or Autumn, is another Sign of
Rain ; because it shews the Air is clogg'd
with Vapours.

PLINY's farther Remarks on the SUN's
Rising or Setting, are these, L. 18. c. 35.
Nat. Hist.

Si in Ortu SOLIS aut in Occasu contracti cernentur
Radii, *Imbrem* significabunt.

Cum Oriente Sole Radii non illustres eminebunt,
quamvis circumdati Nube non sint, *Pluviam* porten-
dunt.

Si Nubes SOLEM circumcludent, quantò minus
luminis relinquent, tantò turbidior *Tempestas* erit. Si
verò etiam duplex Orbis fuerit, eò atrocior.

G 2

Si

52 *Signs of Rain from the Sun.*

Si Oriens SOL cingetur Orbe, ex quâ parte is se aperit, expectetur *Ventus*.

Si in Exortu longè radios per Nubes porriget, & medius erit inanis, *Pluviam* significabit.

Si ante Ortum Radii se ostendent, *Aquam & Ventum*.

Si circa Occidentem candidus Circulus erit, Noctis levem ostendet *Tempestatem*: Si Nebula, vehementiorem: Si candente SOL E, *Ventum*: Si ater Circulus fuerit, ex quâ Regione, is se ruperit, *Ventum magnum*.

The *English* of all which is this ;

If the Rays of the SUN, at his Rising or Setting, be shorten'd, 'tis a Sign of Rain.

When the Rays of the SUN at his Rising are not illustrious, tho' obscur'd by no Cloud, 'tis a Sign of Rain.

When the SUN is involv'd with Clouds, the Darker it is, the more Tempestuous it will be. But if the SUN seems to be divided, the Storm will still be the more violent.

If the SUN at his Rising, be encompass'd with an Iris, which Way soever the Circle opens, you may expect a Wind.

If the SUN at his first Rising has his Rays protracted a long Way thro' Clouds, and his Face obscure, 'tis a Sign of Rain.

If the Rays of the SUN are discover'd before he Rises himself, 'tis a Sign of Rain and Wind both.

If a White Iris be discover'd round about the Setting SUN, 'tis a Sign of a small Tempest that Night: If he be surrounded by a little Cloud or Mist, then expect a vehement Tempest: But if he be surrounded by a Black Circle, from what Quarter soever it comes, you may expect a great deal of Wind. So far PLINY.

Signs

Signs of Rain from the Moon. 53

Signs of Rain from the Moon.

THE MOON likewise has its Signs. Thus a Pale MOON is the Fore-runner of *Rain* ; Red, of *Wind* ; Clear, of *Fine Weather*.

Pallida LUNA pluit, Rubicunda flat, Alba serenat. Si rubicunda exorta est LUNA, Ventos ; Si nigra, Pluvias portendere creditur, says PLINY, L. 18. c. 35.

VIRGIL. *Georg.* L. 1.

LUNA revertentes cum primum colligit ignes,
Si Nigrum obscuro comprehenderit Aëra Cornu;
Maximas Agricolis Pelagoque parabitur Imber.
At si Virgineum suffuderit ore ruborem,
Ventus erit. Vento semper rubet aurea Phæbe.

i. e.

*When first the MOON appears, if then she shrouds
Her Silver Crescent, tipp'd with sable Clouds,
Conclude she bodes a Tempest on the Main,
And brews for Fields impetuous Floods of Rain.
If the MOON's Face with fiery Flushing glow,
Expect the rattling Winds aloft to blow.*

When the MOON is compass'd about with a very large Circle, or is Dim and Misty, then *Wind* or *Rain* follows, or *Snow* speedily, or likely within twenty-four Hours,

Two

54 *Signs of Rain from the Moon.*

Two or three discontinu'd and speckled Circles or Rings round about the MOON, foretel a great *Storm*.

If the MOON's Horns are blunt at its first Rising, at, or within two or three Days after the Change, it denotes *Rainy* Weather for that Quarter ; but *Seasonable* Weather the other Quarters.

In Quinta (says PLINY) Cornua LUNÆ obtusa, Pluviam : Erecta & infesta, Ventos semper significant : Quarta tamen maxime— Si Quartam Orbis rutilus cinget, Ventos & Imbres præmonebit.

Nascens LUNA (says VARRO) si Cornu superiore obatro (vel obatrato) furget, Pluvias decrescens dabit : Si inferiore, ante Plenilunium : Si in Mediâ nigritia illa fuerit, *Imbrem* in Plenilunio.

i. e.

If the Horns of the MOON (says PLINY) are Obtuse the fifth Day after the Change, it signifies Rain : But if sharp, it signifies Wind, especially the fourth Day— If the MOON be encircl'd with a clear ruddy Iris the fourth Day, it foretels Wind and Rain both.

VARRO says, if the New-MOON rises with its uppermost Horn somewhat Black, it will produce *Rain* in its Decrease : But if its Lower Horn be somewhat Black, 'twill produce *Rain* before the Full : But if the Blackness be in the Middle of the MOON, it will be *Rain* in the Full.

Others

Signs of Rain from the Moon. 55

Others have observ'd, that an *Iris* round the MOON, is likewise a Sign of *Rain*, with a South Wind.

And that if the Wind be South the third Night after the Change of the MOON, then you may expect *Rain*, more or less the Day following.

And that likewise if the Wind be South, and the MOON not seen before the fourth Night, you may expect *Rain* most Part of that Month.

What I shall further observe concerning the MOON is this, There have been very Ingenious Gentlemen who have been zealous Advocates for the *Lunar Influence* on Terene Bodies, and have upon many Years Experience asserted, that every New and Full MOON brings Humid Air within the Compass of the *Triduum*, and that it seldom fails of *Raining* within the Space of three Days Before or After every Change and Full ; and particularly that the Full MOON in *April* always brings *Rain*, and that the New and Full MOON in *August* do the like : And that this Rule has not fail'd above Once in almost Thirty Times.

Give

56 *Signs of Rain from the Moon.*

Give me leave to add one or two Prognostic's more of *Rainy Weather*, and those are the *Mock-Suns* and *Moons*. The *Parhelia* or *Mock-Suns* are so many *Images* of the true *Sun* cast upon one or more smooth compacted *Cloud* or *Clouds* on one or both *Sides* of the *Sun*. These *Appearances* are chiefly seen about the *Rising* and *Setting* of the *Sun*. Sometimes there are seen several little *Mock-Suns* like *Stars*: *Des Cartes* says 'tis possible there may be seven seen at one *Time*. This *Multiplicity* is caus'd by many little divided *Clouds*, like the *Reflection* of a *Man's Face* on a *Multiplying-Glass*. The *Appearance* of these *Phænomena* predicts *Tempests* and *much Rain*; because they cannot appear but in a *Watry Disposition* of the *Air*. If they appear on the *South Side* of the *Sun*, they are the *Forerunners* of more *violent Showers of Rain* than on the *North Side*: Because the *Southern Vapours* are sooner dissolv'd into *Water* than the *Colder Northern* ones.

As for the *Mock-Moons* (which have the same Cause as the *Mock-Suns*) they are the *Forerunners* of *Great Rains, Land-Floods*, and *dismal Inundations*.

Signs

Signs of Rain from the Stars.

NOR are the STARS (tho' at so great a Distance) destitute of their Signs. The STARS seeming Bigger than usually, Pale, Dull, and not twinkling, shew the Air is condensing to *Rain*, which will soon fall.

Also the STARS appearing more Bright and Blazing than ordinary in Summer, is a Sign of great *Winds* and *Rain*.

Likewise many STARS appearing in the Night and seeming a greater Number than usual, and the Wind at East in Summer, foretels *sudden Rain*.

Signs of Rainy Weather from the Clouds

AS the *Atmosphere* (or Body of grosser Air surrounding the Globe) rises and reaches above five Miles in Height (as is suppos'd) there is Room sufficient in so expansive a Fluid for the Reception and Distribution, for the Dissipation or Collection of all Kinds of *Vapours* and Exhalations that are rais'd up either by the Solar or Subterranean Heat.

H

To

58 *Signs of Rain from the Clouds.*

To what Height the *Vapours* ascend, does in a great measure depend upon the Degree of Heat wherewith they are actuated and distended, upon the Fineness and Lightness of the *Vapours* themselves, upon the Density of the *Air* wherein they are buoy'd up; and even sometimes upon the Strength and Force of the *Winds* wherewith they are impell'd. Some of them are so far subtiliz'd and attenuated, and rise to so great a Height as not to be distinctly visible, of which Kind (in Sir ISAAC NEWTON'S Opinion) are those that form by Rarefaction the Blue or Azure Colour of the Sky. Other *Vapours* of a grosser Kind, being compacted into CLOUDS, and keeping for some Time a fixt Station in the Regions above, have (as Mr. BOYLE tells us) been reckon'd about Half a Mile high, but very few, and those the Whitest and Loftiest CLOUDS, above three Quarters of a Mile High.

If the Force wherewith a Stormy or Thunder CLOUD is impell'd, be superior to that of its Gravitation, then the farther any such CLOUD moves on in a direct Course, the Higher must such a CLOUD rise;

Signs of Rain from the Clouds. 59

rise ; and the less Resistance it meets with from the Upper Regions, the swifter it will move : But when the protrusive Force of the *Wind* abates, and that of Gravitation prevails, the CLOUD it self will acquire a Degree of Velocity from its extraordinary Height, and fall down in violent *Rain* or *Hail*.

And this will let us into the Natural Reason of a Vulgar Observation, *viz.* That in CLOUDY and Stormy Weather, when the *Wind* falls, it will commonly *rain*, because the CLOUDS are carried on by the Strength of the *Wind*, in a strait Course to a greater Height than the Density of the Superior Regions can support ; as soon therefore as the Horizontal Impulse ceases, the CLOUDS, by their own natural Gravity, must descend in *Rain*.

So much in General for the Prognostications of *Rainy* Weather from the CLOUDS, But to be more Particular :

Many small CLOUDS at North-West, in the Evening, shew that *Rain* is gathering and will suddenly fall.

CLOUDS appearing like Rocks or Towers, signify *great Showers*.

60 *Signs of Rain from the Clouds.*

If small CLOUDS grow bigger and bigger in an Hour or two, they signify a great deal of *Rain*. On the contrary, if great CLOUDS separate, waste off, and grow smaller and smaller, they signify *Fair Weather*.

In Summer (says M. OZANAM) we apprehend a future *Storm* when we see little black loose CLOUDS lower than the rest, wandering to and fro: When at *Sun-rise* we see several CLOUDS gather in the *West*; and on the other hand, if these CLOUDS disperse, it speaks *Fair Weather*.

The often Changing of the *Wind*, which is particularly known by the Course of the CLOUDS, is a Sign of *Rain*; because the CLOUDS are driven with the *Winds*, and the Vapours collected and condens'd, which causes *Rain*.

When the *Sun* looks Double or Triple thro' the CLOUDS, it prognosticates a *Storm* of long Duration. PLINY (in his *Nat. Hist.* L. xviii. c. 35.) says —

NUBES ab Austro Imbres portendent.

NUBES vehementius atræ ab Oriente, in noctem *Aquam* minantur: ab Occidente, in posterum diem.

Si NUBES, ut Vellera Lanæ, spargentur multæ ab Oriente, *Aquam* in triduum prælagient.

Cum in cacuminibus Montium NUBES confident, *hyemabit.*

i. e. CLOUDS

Signs of Rain from the Rain-bow. 61

i. e.

CLOUDS coming out of the South, bring Rain.

Very Black CLOUDS coming out of the East, threaten Rain at Night : Out of the West, the next Day.

If many CLOUDS (like Fleeces of Wool) are scatter'd from the East, they foretel Rain for three Days together.

When CLOUDS settle upon the Tops of Mountains, 'tis a Sign of Hard Weather.

Signs of Rain from the Rain-bow.

IF after a long Drought the RAIN-BOW appears, it signifies *Rain* : But if it appears after a long Time of Wet, it signifies *Fair Weather*.

If it appears very Big, and the Green Colour predominant, it signifies much *Wet* : But if Red be the predominant Colour, then it denotes *Rain* and *Wind* together.

If (after it appears) the Colours grow grosser and darker, *Rain* is gathering : If lighter and fairer, the Contrary.

If it be broken in many Parts, *Tempestuous Winds* are gathering in the Air.

From what Part the RAIN-BOW first begins to break, or vanish, *Winds* will arise and bring *great Showers*.

If

62 *Signs of Rain from the Rain-bow.*

If the RAIN-BOW vanishes and disappears altogether, *Fair Weather* will ensue.

If it appears in the Morning, it signifies small *Rain*, and presently after *Fair Weather*.

If it appears at Noon, it brings a great deal of *Rain*. *A Meridie Ortus magnam vim Aquarum vehit*, says SENECA, (L. i. *Nat. Quaest.* c. 6. p. 836.)

If it appears at Night, then *Fair Weather*. According to the Vulgar Saying,

A RAIN-BOW in the Morning

Is the Shepherd's Warning :

A RAIN-BOW at Night

Is the Shepherd's Delight.

A RAIN-BOW in the *East* or *South* (says M. OZANAM) is a Sign of *Great Rain*, especially if it be of a bright lively Colour : But a RAIN-BOW in the *East* in the Evening, predicts *Fair Weather* ; and if its Colour be Lively and Red, it foretels *Wind*. A RAIN-BOW in the *West* presages an indifferent Quantity of *Rain* and *Thunder*.

If two RAIN-BOWS appear together, it denotes *Fair Weather* for the Present, and
Rain

Signs of Rain from the Rain-bow. 63

Rain two or three Days after. But two RAIN-BOWS appearing at the same Time, one hanging down from the *South*, the other from the *North*, denote *Rain* to follow.

I shall conclude this Chapter with an Account of some uncommon RAIN-BOWS; one of which was a *Lunar Rain-bow* in *Derbyshire*, observ'd by the Curious Mr. THORESBY about *Christmas*, 1710. About Eight in the Evening he observed with great Satisfaction the *Bow* the *Moon* had fix'd in the Clouds; she had then past her *Full* about twenty-four Hours: The Evening had been Rainy, but the Clouds were now dispers'd, and the *Moon* shon pretty clear. This *Iris* had all the Colours of the *Iris Solaris* exceeding pleasant, distinct and grateful to look on, only faint, comparatively to those we see in the Day; as must necessarily follow both from the different Beams that cause it, and the Disposition of the *Medium*. The Largeness of the Arc was not so much less than that of the *Sun*, as the different Dimensions of their Bodies, and their respective Distances from the Earth, seem to require.

But

64 *Signs of Rain from the Rain-bow.*

But as to its Entireness and Beauty of its Colour, 'twas admirable and surprizing. It continu'd about ten Minutes before the Interposition of a Cloud hinder'd his further Observation. Vid. *Philosoph. Transf.* N^o 331. p. 320.

M. BOURZES (in *Phil Transf.* N^o 337. p. 235.) gives us an Account of *Marine Iris's* — The Sea was very much tost, and the Wind coming off the Tops of the Waves, made a kind of Rain, in which the Rays of the *Sun* painted the Colours of a RAIN-BOW. 'Tis true, the Common *Iris* has that Advantage over ours, that its Colours are more lively, distinct, and of longer Extent. In the *Marine Iris*, we cou'd distinguish only two Colours; a dark Yellow on that Side next the *Sun*, and a pale Green on the opposite Side; the other Colours were too faint to be distinguish'd. But these *Iris's* are in a great Number; one may see twenty or thirty together, they appear at Noon-day, and in a Position opposite to that of the Common *Rain-bow*, that is to say, the Curve is turn'd as it were towards the Bottom of the Sea: *Et bibit ingens ARCUS* (as VIRGIL says) And at both Ends the RAIN-BOW drinks the Sea.

Signs

Signs of Rain ceasing.

WHEN a *Shower* comes suddenly, 'tis like to be Fair Weather again in the Space of Half an Hour or an Hour : For there is no *Rain* continues long that comes suddenly ; *Nullum Violentum est Disturnum.*

Also, if it begins to *Rain* an Hour or two before Day, it is like to be Fair before Noon, and to hold so all the rest of the Day. But if it begins to *Rain* an Hour or two before Sun-rising, it is like to *Rain* most Part of the Day after.

Or, when the Air grows thick by Degrees, and the Sun shines duller and duller, till it shines not at all ; or the Moon or Stars by Night ; then it is like to *Rain* six Hours usually.

Also, when it begins to *Rain* from the South with a High Wind for two or three Hours, and then the Wind falls (and it continue *Raining* still) then it is like to *Rain* for twelve Hours or more ; and usually *Rains* till a strong Wind arises to clear the Air. These long *Rains* seldom hold

66 *Signs of the Weather from Mists.*

above twenty-four Hours, or seldom happen above Once a Year.

Signs of the Weather from Mists.

IF the MISTs arise out of Ponds and Rivers, and there vanish away (*i. e.* are either Exhal'd or Subside) they signify *Fair Weather*. But if from thence they are attracted to the Top of Hills, 'tis like there will be *Rain* suddenly, either the same Day, or commonly within two or three Days.

When a MIST, or thin Cloud, happens in a Dry Season, and ascends Upwards, and is turn'd into a thick Cloud, it is a Sign that *Rain* will follow : But when a MIST falls Downward quickly after *Rain*, it is then a Sign of *Fair Weather*.

If before Sun-rising it be a General MIST (both on the Hills and Vales) near the Full-Moon, it signifies *Fair Weather*. But if such a MIST be in the New of the Moon, it signifies *Rain* in the Old of the Moon : But in the Old of the Moon, it signifies *Rain* in the New.

If (says M. OZANAM) after Sun-set, or before Sun-rise, you observe a White Vapour

Signs of the Weather from Mists. 67

pour rising upon Waters, or Marshes or Meads, you will have *Fair* Warm Weather next Day.

Indeed I look upon MISTs as only thinner, uncompacted, and more rarify'd *Clouds* which hang upon the Earth : And tho' we don't call them so whilst we are involv'd in them, yet as soon as they are a little elevated and drawn up, we immediately call them *Clouds* : And oftentimes they are, by the Cold in the Atmosphere, and at no great Distance from us, so condens'd, that they suddenly return upon us in great Showers of *Rain* : Hence 'tis a Common Observation, that when a MIST is drawn up to the Tops of the Hills, 'tis a Sign of *Rain* : But when we see MISTs driven along the Valleys, the Sun rarifying and dispersing them, 'tis a Sign of *Fair* Weather. For as MISTs are nothing else but thin and rarify'd *Clouds*, so are *Clouds* nothing but thick, condens'd, and compacted Vapours or MISTs ; which when so far condens'd as to become too ponderous to be supported by the Air, fall down upon us in *Rain, Hail, or Snow.*

Signs of the Weather from Vegetables.

'TIS very pleasant to observe the Methods of Nature, in guarding the Insensitive Creatures in the *Vegetable* Kingdom, against Harms and Inconveniencies. I have observ'd that many, if not most of them, do expand their Flowers and Down in Warm, Sun-shiny Weather, and again close them towards Evening, or in Rain, especially at the Beginning of Flowering, when the Seed is young and tender : It is manifest in the Down of *Dandelion*, and other Downs ; and eminently in the Flowers of the *Pimpernel* ; the Opening and Shutting of which, are the Country-man's Weather-glass, whereby GERARD says, he foretels what Weather shall follow next Day ; for (says he) if the *Flowers* be close shut up, it foretels *Rain* and Foul Weather ; contrariwise, if they be spread abroad, *Fair* Weather (GER. HERB. B. ii. c. 183. p. 494.) There are three Sorts of this Plant call'd *Pimpernel*, *Anagallis mas*, *fœmina*, & *lutea*. 'Tis like *Chickweed*, the Stalks four-square, trailing upon the Ground,

Ground, beset with Leaves opposite to one another, like *Nummularia* or *Money-wort*, between which on each Side of the Stalk there shoot up two small Tendrels in the Male and Female *, on the Top of which in the Male grow small Flowers of a Purple Colour ; in the Female perfect Blue Flowers ; in the Yellow *Pimpernel* there are only single Tendrels bearing single Yellow Flowers. These *Pimpernels* grow commonly in Gardens and plow'd Fields near Path-ways. They flower about *August*, and so are of good Service to the Husbandmen in managing their Harvest-Work by foretelling the Weather.

Likewise the TREFOIL (says my Lord BACON) swells in the Stalk against *Rain*, and so stands more Upright ; for by *Wet* Stalks do erect, and Leaves bow down. TRIFOLIUM (says PLINY) *inhorrescere, & Folia contra Tempestatem subrigere, certum est.*

The

* The Distinction between Male and Female Plants or Trees, is found to be a Vulgar Error : For every Plant or Tree contains in it self Male and Female Powers, having their Seeds in themselves (as MOSES observes) and wanting Local Motion, are able to propagate without the Help of one of the same Species.

The Natural Reason of all which is this, PLANTS are a sort of Natural *Hygrometers*, being compos'd of an infinite Number of Fibres, *Tracheæ* or Air-Vessels, Arteries and Veins, which are like so many Canals or Pipes, thro' which the Moisture of the Air, as well as the Juice of the Earth, is convey'd into all their Parts.

PLANTÆ igitur (says MALPIGIUS) cum sint Vientia (ut conjecturari fas est) Visceribus infixæ Terræ, ab hac, seu potiùs ab Aquâ & Aëre, commixtis & percolatis à Terrâ, Respirationis suæ materiam recipiunt, ipsarumque *Tracheæ* ab halitu Terræ, extremas Radices subingressò, replentur. i. e.

Since PLANTS are Vegetables and fixt in the Bowels of their Mother Earth, they receive the Matter of Respiration from Her, and rather from Water and Air drain'd from the Earth; and their Air-Vessels are replenish'd from the Halitus of the Earth, being suck'd in at the Extremities of the Roots.

These *Tracheæ* or Air-Vessels are visible, and appear very pretty in the Leaf of the *Scabious*, or the *Vine*, by pulling asunder some of its principal Ribs, or great Fibres; between which may be seen the Spiral *Air-Vessels* (like Threads of Cobweb) a little uncoyl'd: A Figure whereof Dr. GREW has given us in his *Anat. Plant.* Tab. 51, 52.

Vid. MALPIG. *Op. Anat. Plant.* p. 15.

Dr. GREW's *Anat. Plant.* L. iii. c. 3. § 16, &c.

Mr. RAY's *Hist. Plant.* L. i. c. 4.

Signs

Signs of Fair Weather:

First from the SUN.

THE SUN rising in the Morning fair and bright, and setting at Night blushing, without Spots or black Clouds near it, is one Sign of *Fair Weather*. Thus PLINY, L. xviii. c. 35.

So L purus Oriens, atque non fervens, *Serenum* diem nunciat. Si & occidet pridè Serenus, & Oritur, tanto certior fides *Serenitatis*.

Si circa SOLEM Occidentem rubescant Nubes, *Serenitatem* futuræ Diei spondent.

Si ab Ortu SOLIS repellentur Nubes, & ad Occasum abibunt, *Serenitatem* denunciabunt.

Si SO L Oriens cingetur Orbe, & postea totus defluerit æqualitèr, *Serenitatem* dabit.

i. e.

The SUN rising clear, and not Hot, promises a Fair Day. If it rises clear, and sets clear the Day before, you may be the more sure of Fair Weather.

If the Clouds about the Setting SUN look Red, the next Day is like to be Fair. According to an old Saying,

The Evening Red, and the Morning Grey,
Is a Sign of a *Fair Day*.

If the Clouds are driven from the SUN-rising, and pass away to the West, it is a Sign of Fair Weather.

If the Rising-SUN be encompass'd with an Iris, and afterwards that Iris wear away equally on all Sides, it is a Sign of Fair Weather.

Signs

72 *Signs of Fair Weather*

Signs of Fair Weather from the MOON and STARS.

THE MOON, when she is three or four Days old, and has her Horns sharp and pointed very bright, predicts *Fair Weather* till the *Full*, if not all the Month.

A bright or shining Circle about the MOON when at *Full*, promises *Fair Weather* for many Days. Thus VIRGIL,

Sin Ortu in Quarto (namque is certissimus Auctor)
Pura, neque obtusis per Cælum cornibus ibit,
Totus & ille Dies, & qui nascentur ab illo
Exactum ad Mensē, *Pluviâ Ventisque* carebunt.

i. e.

*The Moon, if four Nights old (the surest Sign)
With sharpen'd Horns if glorious then she shine,
Next Day, nor only that, but all the MOON,
'Till her revolving Race be wholly run,
Are void of Tempests both by Land and Sea.*

And hence PLINY, L. 18. c. 79.

Quartam LUNAM maximè observat Ægyptus: Si
splendens Exorta puro nitore fulsit, *Serenitatem* præ-
figit — Si Plenilunio per dimidium pura erit,
Dies *Serenos* significabit.

i. e.

*The Ægyptians make their Observations upon the
MOON chiefly when she is four Nights Old. If she rises
Fair and Clear, she promises Fair Weather — If
she be but half clear at the Full, you may expect Fair
Days.*

The

from the CLOUDS. 73

The STARS likewise shining Clear and Bright, seeming to dart out pointed Rays, denote *Fair* Weather. Thus VIRGIL;

— Neque infidiis Noctis capiere Serenæ.

Nor shall a Starry Night thy Hopes betray.

Nam nequè tum STELLIS acies obtusa videtur,

The STARS shine smarter —

Signs of Fair Weather from the CLOUDS.

LITTLE CLOUDS sinking low, as into Valleys, at South-East, or South-West, are Signs of *Fair* Weather. So VIRGIL;
At NEBULÆ magis ima petunt, campoque recumbunt.
But a blue doughty MIST descends upon the Plain.

And PLINY,

NEBULÆ è Montibus descendentes, aut Cælo cadentes, vel in Vallibus fidentes, *Serenitatem* promittunt.

Another Sign of *Fair* Weather is, when the CLOUDS drive one way, and the *Wind* another; because the Wind rarifies the Air, and so keeps up the Rain.

Also CLOUDS appearing white like Fleeces of Wool, scatter'd about in the Sky to the *North-West*, and the SUN of a good Height, are another Sign of *Fair* Weather.

K

MISTS

74 *Signs of Fair Weather*

MISTS likewise, or white Clouds, hanging just over Rivers, and dispersing no farther.

The *Rain-bow* also appearing after a Shower, and the Blue and Yellow Part of it very Bright, and the lightest Colour, are Signs of *Fair Weather*.

Also a *Rain-bow* of only two Colours, Red and Yellow, is a Sign of *Fair Weather*.

Frequent Flashes of Lightning without Thunder, in an Evening, is also a Sign of *Fair Weather* the next Day.

Another Sign of *Fair Weather*, is the Clearness on the Tops of Hills — *Si cacumina Montium pura fient, Dies Serenus erit, says PLINY.*

Signs of Fair Weather from INSECTS.

SPiders Webbs in the Air, or on the Grass and Trees, foretel very *Fair* and Hot Weather. Dr. LISTER (*Philos. Transf.* N° 50. p. 1014.) gives a full Account of these *Spiders* (call'd *Lupi*) darting their Threads into the Air, and swimming in it. All *Spiders* that spin in a Thread, are the Makers of those long Threads in the Air in Summer, and especially towards *September,*

tember, so much wonder'd at, and in such infinite Numbers every where. They will dart out a whole *Stamen* or Sheaf at once, consisting of many Filaments; yet all of one Length, all divided each from the other, and distinct, till some Chance either snap them off or entangle them. The same Ingenious Author taking notice one Day that the Air was full of these *Spiders Webbs*, got upon the Top of the Highest Steeple on the Minster of *York*, and did thence discern them yet exceeding High above him.

Other Signs of *Fair Weather* we have from other INSECTS, particularly BEEs, when they fly far from their Hives, and come late Home. Great Swarms of GNATS presage the same.

So do GLOW-WORMS by Night. These (says Dr. POWER, in his *Microsc. Obs.* p. 23.) are those *Night-Animals* with their Lanthorns in their Tails, those Creeping *Stars*, (*Stella Terrestres*, MOUFFET calls them) that seem to out-shine those in the Firmament, and to out-vie them too in this Property especially, that whereas the *Celestial Lights* are quite obscur'd by the Interposi-

76 *Signs of Fair Weather*

tion of a small Cloud, these *Terrestrial Stars* are more enliven'd and enkindl'd thereby, whose pleasant Fulgor no Darkness is able to eclipse. These INSECTS are of the *Beetle* kind, call'd by the *Greeks Lampyrides*, à λάμπω, *luceo*. The Tail of a GLOW-WORM is made of seven Shelly Rings, at the last of which are visible the two Shining Points. The Light made by this INSECT (says Sir THOMAS BROWN, in his *Vulgar Errors*) depends upon a living Spirit, and seems by some Vital Irradiation to be actuated into this Lustre; for when they are dead, they shine not, nor always when they are alive, but give Light according to the Diffusion of this Spirit, and the Protusion of their Luminous Parts. But ALEXANDER ROSS (in his Animadversions on Dr. BROWN's *Vulgar Errors*, in his *Arcana Microcosmi*, pag. 142.) makes this Remark — “ When (says he) “ Sir THOMAS BROWN says that the Light “ of the *Glow-worm* depends upon a living Spirit, he expresses but a remote “ Cause: for the Proximate and Immediate “ Cause is the Natural Heat in a clear “ Luminous Water or Humor: For I have “ ob-

from INSECTS, &c. 77

“ observ’d in those I kept some Days in
“ Grass, that as this Heat decreas’d, the
“ Humor thickned, and as it were con-
“ geal’d, and so the Light grew dimmer;
“ being quite Dead there remain’d the
“ congeal’d Humor white like a Piece of
“ Chalk. Those I took were for three
“ or four Nights so Shining, that holding
“ a Book near, I cou’d see to read by them.”

These INSECTS are the *Husbandmen’s*
Monitors to bring in their Harvest; as
VIRGIL says,

His tandem studiis Hyemem transegimus illam.
Ver rediit, jam Sylva viret, jam Vinea frondet,
Jam spicata CERES, jam cogitat horrea Messor
Splendidulis cum Nocte volant *Lampyrides* alis.

Altho’ (as M^{ou}FFET remarks) *In omnibus*
Regionibus non est idem Tempus Messis.

Signs of Fair Weather from BIRDS.

LARKS rising very High, and continu-
ing Singing for a long Time.

The KITE also flying aloft, shows *Fair*
and Dry Weather. The Reason of which
(says my Lord BACON) may be this, Be-
cause the *Kite* mounts most into the Air
of that Temper wherein he delights: For
this

78 *Signs of Fair Weather*

this aspiring *Bird* affects not so much the Grossness of the Air, as the Cold and Freshness of it ; for being a *Bird* of Prey, and therefore Hot, he delights in the fresh Air, and many times flies against the Wind, as *Trouts* and *Salmons* swim against the Stream. And yet it is true also, that all *Birds* find an Ease in the Depth of the Air, as *Swimmers* do in a Deep Water. And therefore when they are Aloft, they can uphold themselves with their Wings spread, scarce moving them. The like PLINY observes of the CRANE — GRUES *silentio per sublime volitantes, Serenitatem præfagiunt.* SWALLOWS likewise flying High presage *Fair Weather*. And PLOVERS or LAP-WINGS flying High, and then Low, making also continual Cries, fore-shew *Warm Weather*. The like VIRGIL elegantly remarks of the RAVENS,

Tum liquidas CORVI presso ter gutture voces
Aut quater ingeminant : & sæpè cubilibus altis
Nescio quâ præter solitum dulcedine læti
Inter se foliis strepitant : Juvat imbris actis
Progeniem parvam dulcisque revifere nidos.
Haud equidem credo, quia sit Divinitus illis
Ingenium, aut rerum Fato Prudentia major.
Verum, ubi Tempestas & Cœli mobilis humor

Mutavere

Mutavere vias, & JUPPITER uvidus Auftris
Densat, erant quæ rara modo, &, quæ densa, re-
laxat ;

Vertuntur Species Animorum, & pectora motus
Nunc alios, alios, dum Nubila Ventus agebat,
Concipiunt. Hinc ille AVIUM Conventus in Agris,
Et lætæ PECUDES, & Ovantes gutture CORVI.

i. e.

*Then thrice the RAVENS rend the liquid Air,
And croaking Notes proclaim the settled Fair.
Then round their Airy Palaces they fly
To greet the SUN ; and seiz'd with secret Joy,
When Storms are over-blown, with Food repair
To their forsaken Nests, and callow Care.
Not that I think their Breasts with Heav'nly Souls
Inspir'd, as Man, who Destiny controuls.
But with the changeful Temper of the Skies,
As Rains condense, and Sun-shine rarifies ;
So turn the Species in their alter'd Minds,
Compos'd by Calms, and discompos'd by Winds.
From hence proceeds the BIRDS harmonious Voice,
From hence the CROWS exult, and frisking Lambs
rejoice.*

BATS likewise flying about in the
Evening sooner and more than usual, is a
Sign of *Fair* and *Hot* Weather the next
Day. For the Clearness of the Air enli-
vens these *Birds*, or rather Flittering Mice.

OWLS Hooting much is another Sign of
Fair Weather ; tho' *Owls* hoot much both
in Wet and Dry Weather, with this Dif-
ference,

80 *Signs of Fair Weather*

ference, in Wet their Hooting is more Clamorous, as PLINY observes — NOCTUA *in imbre garrilla* : But in Fair Weather, more Easy and Sedate, as VIRGIL says,

SOLIS & Occasum servans de culmine summo
Nequicquam feros exercet NOCTUA cantus.

i. e.

*And OWLS that mark the Setting-Sun declare
A Star-light Evening, and a Morning Fair.*

Also *HALCYONS, i. e. King-Fishers and COOTS, and other Sea-Fowl, leaving the Shores and flocking to Sea, is another Sign of *Fair Weather*. Thus VIRGIL again ;

Non tepidum ad SOLEM pennas in littore pandunt
Dilectæ Thetidi HALCYONES ———

i. e.

*The filmy GOSSAMER now flits no more,
Nor HALCYONS bask on the short Sunny Shore.*

And PLINY says, L. ii. c. 47. L. 18. c. 26.

ALCEDO septem Diebus nidificat in Mari, & septem postea fœtificat ; qui Dies HALCEDONII dicuntur, quibus Diebus Mare *placidum* & navigabile est: Hoc ergo Signum est, cum ALCEDONES non pandunt alas.

i. e. *The*

* Halcyon (*the King's Fisher*) Gr. Ἀλκυόν, παρὰ τὸ ἐν ᾧ καί, quod concipiat in Mari, & in eo fœtus excludat.

Lat. *Halcedo*, ab algere quod algidis & frigidis temporibus in Mari pariat. Interea verò serenum est Cœlum, tranquillum Mare. Unde Dies illi sereni Græcis Ἀλκυονίδαι, Latinis *Halcyonia* dicuntur.

Signs from FISHES, &c. 81

i. e.

The HALCYON is seven Days in building her Nest in the Sea, and seven Days in bringing forth her Young; which Days are call'd HALCYON-Days, in which Days there is a perfect Calm at Sea. This therefore is the Signal to Mariners, when the HALCYON-Bird ceases flying about.

Signs from FISHES.

NOT only BIRDS but FISHES also, by their frequent Rising and Flurting upon the Surface of the Water, do foretel *Fair Weather*.

DELPHINI (*says PLINY*) turbato Mari spargentes Aquam, *Tranquillitatem* præfagiunt; i. e. The DOLPHINS *spurting up Water in a Storm*, foretel a Calm.

Signs of the Weather from the WINDS.

THE Reverend and Learned Mr. SAUL (in his Hist. and Philos. Account of the Barometer) gives us this Account of the WINDS—As the WINDS encrease the Quantity and Weight of the Air, and by that means support the Vapours; so are they sometimes the immediate Occasion of their Falling. For when (for Instance) the *Winds* blow from opposite

L

Quar-

82 *Signs of the Weather*

Quarters, the Mists and Vapours floating in the different Streams of Air, must be forcibly driven against each other, and confusedly mix'd and blended together : and as they were before separately æquiperate to the *Air*, and for that Reason floated in it, so after such Confluence and Conjunction, they will doubly exceed the Weight of the Air, and force their Descent thro' it. And this is usually the Cause, both of the largest Drops, and of the greatest and most plentiful *Rains*. But when either of these Opposite *Winds* rises and prevails, and turns the whole Stream of Clouds and Vapours only one way, it soon clears the Hemisphere, and restores better *Weather*. From hence we may farther observe, that the particular Effect the *Winds* have upon the Changes of the *Weather*, depends, in a great measure, upon the present State and Quality of the *Atmosphere* ; for when that is Moist and Humid, or charg'd with Clouds and Vapours, the Change of the *Wind* into an Opposite Quarter, soon produces *Rain* : But when the *Atmosphere* is clear and free from Vapours, it adds to the Weight and Quan-

Quantity of the Air ; and, by that means, continues and prolongs *Fair* Weather.

The WINDS are the Cause of the sudden and extraordinary Alterations of the Gravity of the *Air* ; the Nature of the WINDS is such, that by the Experience we have of them, we may thence predict (very near) the Weather that will ensue for two or three Days after. We know (for Example) in this Climate, that a *South*-Wind generally brings *Rain*, and a *West*-Wind yet more ; (which is the predominant *Wind* here, because the Ocean lies on that Side) That the *North*-Wind brings *Fair* Weather, as well as the *East*-Wind, which does not last so long as the former. Therefore the *North-East* and *South-West* Winds are the only *Winds* that I shall insist upon at present.

It has been an Observation made by some, that have been very Curious Observers of the Weather for many Years, That in eight Years Time there is as much *South* and *West* Wind, as *North* and *East* Wind ; and consequently as many Wet Years as Dry.

Now I will give you a Rule how you may know when the WIND will fit in no

84 *Signs of the Weather*

one of these two Points for two or three Months together, for the most part.

First, for the *North-East* Wind: When the *Wind* turns to this Point, and continues two Days without Rain, and turns not *Southward* the third Day, nor Rains, then it is like to continue *North-East* for eight or nine Days without Rain, and then return into the *South*.

If the *Wind* turn out of the *South* to the *North-East* again, and continue in that Point without Rain for two Days, and turn not *South* the third Day, nor Rain the third Day, it is like to continue *North-East* for two Months, or three for the most part. The *Wind* will finish these Turns towards the *North* in three Weeks Time.

Secondly, for the *South-West* Winds: When the *Wind* has been in the *North* for two Months or more for the most part, and comes to the *South*, usually there are three or four Fair Days at first, and then the fourth or fifth Day comes Rain, or else the *Wind* turns *North*, or continues Dry still.

If

If it return to the *South* within a Day or two without Rain, and turn *Northward* with Rain, and return into the *South* the first or second Day as before, two or three times together after this sort, then it is like to be in the *South* or *South-West* two or three Months together for the most part, as it was in the *North* before. The *Wind* will finish these Turns in a Fortnight.

I mention not the *East* or *West* Winds, because the Rain comes usually from the *South*, or in the Shifting of the *Wind* from the *South* to the *North*. As for the Drought, the *Wind* is for the most part *North-East*.

If it be fair Weather out of the *South* for a Week together (which is not usual) it is like to be great Drought, when it has been a long Time of Rain out of the *South* before.

Usually the *Wind* turns from the *North* to the *South* quietly without *Rain*, but comes back again into the *North* with a strong *Wind* and *Rain*. The greatest *Winds*, which blow down Houses and Trees, usually come by the Turning of the *Wind* out of the *South* by the *West*, into the *North*, which drives away Rain and clears the Air.

PLINY

PLINY (in his *Nat. Hist.* L. ii. c. 47. & L. xviii. c. 34.) gives this Account of the WINDS :

Auster Africæ serenus, *Aquilo* nubilus. Omnes *Venti* vicibus suis spirant. De ratione eorum Menstrua, Quarta maximè *Luna* decernit—*Austro* majores flatus eduntur quàm *Aquilone* ; quoniam ille infernus ex imo Maris spirat, hic summo. Ideoque post *Austros* noxii præcipuè *Terræ-motus*. Noctu *Auster*, interdiu *Aquilo* vehementior. Et ab Ortu flantes diuturniores sunt ab Occasu flantibus. *Septriones* impari ferè definunt numero—*SOL* & auget, & comprimit flatus : auget Exoriens Occidensque, comprimit Meridianus æstivis temporibus. Itaque medio Diei aut Noctis plerumque sopiuntur : qui aut nimio Frigore, aut Æstu, solvuntur. Et imbris *Venti* sopiuntur.

Vulturnus (Anglicè *South-East Wind*) si à Serenâ Cæli partè cœperit flare, non durabit in noctem : at *Subsolanus* (*East-Wind*) in majorem partem noctis extenditur. Quisquis erit *Ventus*, si fervidus sentietur, pluribus diebus permanebit. *Aquilonem* (*North-East Wind*, for so PLINY construes the Word *Aquilo*) prænunciat Terra siccescens repentè ; *Austrum* (*South-Wind*) humescens rore occulto. i. e.

The South Wind in Africa is serene, and the North-East Wind cloudy. All the Winds blow in their Turns. 'Tis the fourth Day of the Moon chiefly, that does rationally discover their Changes. 'Tis the South-Wind that is more boisterous than the North-East, because that arises from the Bottom of the Sea, this from the Top. Therefore after the South-Winds, the Earth-quakes are most noxious.

The

The South-Wind by Day, and the North-East Wind by Night are most vehement. And those that blow from the East, are more lasting than those that blow from the West. The Northern Winds do not always cease at once—The SUN both encreases and stops their Flatus : It encreases it both at its Rising and Setting ; and stops it at Noon in the Summer-time. Therefore commonly those Northern Winds are appeas'd at Mid-day or Mid-night ; being quite put down either by too much Cold or too much Heat. And all Winds are appeas'd by Showers of Rain.

The South-East Wind, if that Part of the Sky be clear from whence it begins to blow, won't last all Night ; but the East-Wind lasts most Part of the Night. Be it what Wind it will, if it be boisterous, it will continue many Days. If the Ground dries on a sudden, it foretels a North-East Wind ; but a small Dew upon the Ground is a Sign of a South Wind. Thus far
PLINY.

Common Observations on the WINDS in
Great-Britain, are as follow ;

The North-Wind is cold,

The North-East colder.

But when the Wind is full in the East,

It is good for neither Man nor Beast.

The South-Wind often brings some Rain,

The South-West Wind brings more Rain.

But when the Wind is West,

It is much the best.

When the Wind is still,

The Weather is not ill.

Signs

88 *Signs of Windy and Wet Weather*

Signs of Windy and Wet Weather from the SUN.

IF the SUN arises with an *Iris* or Circle about him with divers Colours, or that declines unto a fiery Redness ; or if the Rays of the SUN darting thro' the Clouds be Red and Long, it is a Sign of Great *Winds*.

And if after the SUN's Setting in the *West*, Red fiery Clouds shall appear, 'tis a sure Sign of ensuing *Wind*.

Or if the SUN looks Red, or of an Orange-colour, some Time before its Setting, 'tis a Sign of ensuing *Wind*.

M. OZANAM says, an *Iris* or Circle round the SUN with a fair clear Air, is a Sign of *Rain*, but in the Time of Rain 'tis a Sign of Fair Weather.

Signs of Windy and Wet Weather from the MOON.

CORNU LUNÆ (says PLINY, *Nat. Hist.* L. xviii. c. 79.) *Septentrionale* acuminatum atque rigidum, illum præfagit *Ventum* : inferius *Austrum* : Utraque recta, Noctem *Ventosam*. Si Quartam orbis rutilus cingit, *Ventos & Imbres* præmonebit.

VARRO'S

V A R R O's Opinion is this —

Si Quarto die LUNA erit directa, magnam *Tempestatem* in Mari præfagiet, nisi Coronam circa se habebit, & eam sinceram : quoniam illo modo non ante Plenam LUNAM hiematurum ostendit.

Si *Plenilunio* per dimidium pura erit, dies *Serenos* significabit : Si rutila, *Ventos* : nigrescens, *imbres*.

Si caligo orbis nubem incluserit, *Ventos*, qua se ruperit : Si gemini Orbes cinxerint, majorem *Tempestatem*. Et magis, si tres erunt, aut nigri, interrupti atque distracti —

Si plena circa se habebit Orbem, ex quâ parte is maximè splendeat, ex eâ *Ventum* ostendet : Si in Ortu *Cornua* crassiora fuerint, horridam *Tempestatem*. Si antè Quartam non apparuit, *Vento Favonio* flante, Hyemalis toto Mense erit. Si Decimo sexto vehementius flammea apparuerit, *asperas Tempestates* præfagiet.

Sunt & ipsius LUNÆ 8 Articuli, quoties in angulos SOLIS incidit, plenisque inter eos tantum Observantibus Præfagia ejus ; i. e. Tertia, Septima, Undecima, Decima-quinta, Decima-nona, Vigesima-tertia, Vigesima-septima, & Interlunium.

i. e.

The MOON's Horn pointing towards the North, and being sharp-pointed, foretels a North Wind : The lower Horn, the South Wind : When both of them are strait and sharp, they foretel a Windy Night. If the MOON be encompass'd with a bright ruddy Circle when she is four Nights Old, she foretels both Windy and Showry Weather : says PLINY.

M

V A R R O's

90 *Signs of Windy and Wet, &c.*

V A R R O's Opinion is this —

If the MOON, when she is four Days Old, has her Horns sharp, she foretels a Great Tempest at Sea, unless she has a Circle about her, and that too Entire; because by that she shews that it is not like to be Bad Weather till 'tis Full Moon.

If the MOON, in her Full, be but Half clear, she foretels Fair Weather: If Bright and Ruddy, she foretels Winds: If Black, Showers.

If the MOON be included in a Cloudy Circle, it foretels Wind where it breaks forth: If she be included in two Circles, expect a Greater Tempest: and more still if there be three Circles, and those Black, Broken, and Dispers'd.

If the MOON has a Circle round about her at her Full, from what Quarter soever she shines most, from thence expect a Wind. If at her first Rising her Horns appear blunter, you may expect a dreadful Tempest. If the MOON don't appear till she is four Days Old, and the Wind be Westward, it will be Bad Weather all the Month. If the MOON, when she is sixteen Days Old, appears much inflam'd, it foretels Severe Tempests.

There are 8 Points of the MOON, whenever she happens to be at Right Angles with the SUN, and as many Observations to be made at those Times, viz. 3, 7, 11, 15, 19, 23, 27. and the Interlunium; i. e. the Space when neither the New Moon nor Old is seen.

M. O Z A N A M says, An Iris or Circle round the MOON, is a Sign of *Rain* with a *South Wind*.

Signs

Signs of the WINDS changing. 91

Signs of the WINDS changing.

WHEN the SUN rises with many pale Spots appearing in its Orb, and Part of it hid in a Cloud, the WIND (in what Point soever it be) will soon turn to the *South*.

When the WIND has been settled twenty-four Hours or more, in any of the full Points (as *North*, *East*, *West*, or *South*) when it begins to turn, it will not settle till it comes to the opposite Point, as from the *North* to the *South*, and so from full *East* to full *West*; and so of the Angular Points, as from the *North-East* to *South-East*.

Let the WIND be in what Quarter it will, upon the *New-Moon* it presently changes.

When the Generality of the Clouds rack, or drive with the *Wind* (tho' there are many in little Fleeces, or long Strakes, lying higher and appearing not to move) the *Wind* is flagging, and will quickly change and shift its Point.

92 *Signs of TEMPESTS arising.*

Signs of TEMPESTS arising.

MY Lord BACON mentions these as Prognostics ; *viz.* the Resounding of the Sea from the Shoar, and the Murmuring of the *Winds* in the Woods without any apparent Wind, shew *Wind* to follow. For such *Winds*, breathing chiefly out of the Earth, are not at the first perceiv'd, except they be pent by Water or Wood. And therefore a Murmur out of the Caves likewise portends as much.

SO VIRGIL ;

Continuo *Ventis* surgentibus aut freta Ponti
Incipiunt agitata tumescere, & aridus altis
Montibus audiri Frigor ; aut resonantia longè
Littora misceri, & *Nemorum* increbescere Murmur.

i. e.

*For e'er the rising Winds begins to roar,
The working Seas advance to wash the Shoar :
Soft whispers run along the leavy Woods,
And Mountains whistle to the Murm'ring Floods.*

Again,

Sæpè levem *Paleam* & *Frondes* volitare caducas
Aut summâ nantis in Aquâ concludere *Plumas*.

i. e.

*And Chaff with Eddy Winds is whirl'd around,
And dancing Leaves are lifted from the Ground,
And floating Feathers on the Waters play.*

Hence

Signs of TEMPESTS arising. 93

Hence PLINY almost Verbatim :

Equidem & *Montium* sonitus, *Nemorumque* Mugitus prædicunt : & sine Aurâ quæ sentiatur, *Folia* ludentia. *Lunago Populi* (Ang. Poplar-tree) aut *Spinæ*, volitans : Aquis *Pluma* innatans. Atque etiam in Campis *Tempestatem* venturam præcedens suus fragor.

And thus HORACE, Od. xvii. B. iii.

———— Cras *Foliis* Nemus

Multis, & algâ Littus inutili

Demissa Tempestat ab Euro

Sternet, Aquæ nisi fallit Augur

Annosa CORNIX ———

i. e.

To-morrow furious WINDS shall spread
The troubl'd Shoar with useleſs Weed,
And fill the Woods with ſcatter'd Leaves,
Unleſs the Cawing CROW deceives,
The CROW that ſtill foretels a Rain
And Storm, and never Caws in vain.

The AIR and FIRE (ſays my Lord BACON) have ſubtil Perceptions of the *Wind* *arising*, before Men find it. We ſee the Trembling of a *Candle* will diſcover a *Wind* that otherwiſe we do not feel ; and the flexious Burning of *Flames*, ſhews the Air is beginning to be unquiet ; and ſo do *Coals of Fire*, by caſting off the Aſhes more than uſual. The Reaſon is, becauſe no *Wind* at firſt, till it has agitated the *Air*, is apparent to the Senſe ; but *Flame* is eaſier to move than *Air*. And for the
Aſhes,

94 *Signs of TEMPESTS arising.*

Ashes, 'tis no wonder if *Wind* unperceiv'd
shake them off, for we usually try which
Way the *Wind* blows by casting up *Grass*
or *Chaff*, or such light Things into the
Air— Thus far my Lord BACON : which
seems to be nothing else but a Translation
out of VIRGIL and PLINY :

Nec nocturna quidem carpentes pensa Puellæ
Nescivere *Hyemem* ; testâ cum ardente viderent
Scintillare *Oleum*, & putris concrefcere *Fungos*.

i. e.

The Nightly Virgin, while her Wheel she plies,
Foresees the Storm impending in the Skies,
When sparkling Lamps their Sputt'ring Light ad-
vance,

And in the Sockets Oily Bubbles dance.

And PLINY more fully :

TERRENI IGNES significant : *Pallidi* namque
Murmurantesque, *Tempestatem* nuncii sentiuntur.
Pluviæ etiam in *Lucernis Fungi*. Si *flexuosæ* volitet
Flamma, *Ventum*. Et *Lumina* cum ex se *Flammæ*
elidunt, aut vix accenduntur. Item cum in eo pen-
dentes coacervantur *Scintillæ* : vel cum tollentibus
ollas *Carbo* adhærescit : aut cum contactus IGNIS
à se *Favillam* discutit, *Scintillamque* emittit : vel cum
Cinis in foco concrefcit, & cum *Carbo* vehementèr
perlucet.

i. e.

TERRENE FIRES have their Signification : for
your Pale and Murmuring FIRES are Forerunners of
Storms. The very Snuff of a Candle will foretel Rain.
The trembling Flame prognosticates Wind. And Lamps
when they go out of themselves, or are hard to be lighted.

When

Signs of TĒMPESTS arising. 95

When small Sparks of Fire fly off very plentifully. Or when dead Coals stick to the Bottom of Pots when they are taken off the Fire. Or when conceal'd Fire shakes off its dead Ashes, and sends out live Sparks. Or when extinguish'd Cinders begin to rekindle, and dead Coals revive.

The Reverend and Ingenious Mr. *Robinson* (in his *Nat. Hist. of Westmorland*, p. 7, &c.) gives us this Account of the Origin of *Wind* — That, in the greatest Probability, it proceeds from vast Swarms of Nitrous Particles arising from the Bottom of the Sea, which being put into Motion, either by the Central Fire, or by that Heat and *Fermentation* which abounds in this Great Body of the Earth : And therefore this first Commotion, excited by the said Fermentation, we call *A Bottom-Wind*, which is presently discover'd by *Porpices* and other Sea-Fish, which delight in Sport and Play upon the Waves of the Sea ; who by their Playing give the Mariners the first Notice of an approaching *Storm*. When these Nitrous Swarms are risen towards the Surface of the Sea, in a dark Night, they cause such a *Shining Light* upon the Waves, as if the Sea were on Fire, and being deliver'd from

96 *Signs of TEMPESTS arising.*

from the brackish Water, and receiv'd into the Open Air, those Fiery and Shining Meteors which fix upon the Masts and Sides of the Ships, and are only Nitrous Particles condens'd by the circumambient Cold, and like that which the Chymists call *Phosphorus* or Artificial *Glow-worm*, shine and cast a Light, but have no Heat : This gives to Mariners the second Notice that the *Storm* is rising ; for upon the first breaking out of the *Wind*, the Sea begins to be rough, and Waves swell and rise, when at the same Time the Air is calm and clear.

This boiling *Fermentation* of the Sea causes the Vapours to arise, which by the Intenseness of the Circumambient Cold, is condens'd into thick Clouds, and falls down in Storms of *Wind* and *Rain*, first upon the Sea from whence they rose, and then the attractive Power of the Mountain-Cold, by a secret Magnetism, between Vapour and Cold, attracts the Waterish Vapours, intermixt with Nitrous Particles, to the High Tops of Mountains and Hills, where they hang hovering in thick Fogs and Waterish Mists, until the Atmospheric

rical

Signs of TEMPESTS arising. 97

rical Heat rarifies the Nitrous Part of the Fog (which is always uppermost, and appears white and translucent) into brisk Gales of *Wind*; and the Intenfeness of Atmospherical Cold, having attracted the Vapours into the Colder Regions of the Air, where, being condens'd into Clouds, the *Wind* breaks, dissipates, and drives them before it, till they fall down in *Rain*, and water the Surface of the Earth: and this seems to be the Reason why in *Ægypt* and those level Countries, where they have no Mountains, they have little *Wind*, and less *Rain*. Thus far this Ingenious Author. And no doubt but the very same Observations may be made upon Eruptions from the Caverns of the Earth, as well as the Sea.

What seems to countenance this Author's Opinion, is a late Account of a *Phenomenon* in the Sea (mention'd in Mr. *Read's Journal*, N° 1885.) related by a Relation of this Author, which is as follows —
A Prodigy has lately happen'd about the Island of *Tercera* (an Island of the *Atlantic Ocean*, the Chief of the *Azores*) seventeen Leagues distant S. E. from it,
N about

98 *Signs of arising Tempests, from*

about the 20th of *November*, in the Year 1720, by *Fires* which break out on the Surface of the Sea, with a most violent Impetuosity, throwing up Pumice-stones and other Cumbustibles, and has form'd an *Island* of three Leagues long and as many broad, having considerable Height, and Mountainous, with five *Vulcano's*, making a most hideous Noise like Thunder or Great Guns, and a *Cloud* proceeding from it, breaking into small *Rain* of *Sand* instead of Water, and smelling like Brimstone—— This astonishing Irruption caus'd a great *Earthquake* in the said *Island*, which threw down a great many Houses in the City of *Angra* and the adjacent Parts. And in *May* following it was still burning with *Fire* and *Smoke* and roaring Noise.

*Signs of arising Tempests, from the SUN,
MOON, and STARS.*

IF at SUN-rising pale Spots seem to appear in its Orb, and dazzle there, strong *Winds* will ensue from the *South*, the Wind soon shifting to that Point in whatever Quarter it was before.

IF

the SUN, MOON, and STARS. 99

If there appear fiery Spots, or those of a Reddish Colour, in the SUN upon its Setting, much *Wind* will ensue speedily. And oftentimes a Red lowring Morning is the Forerunner of *Wind*.

If the MOON blushes, and is Redder than usual, *Winds* are engendering, and *Storms* will arise.

Also a Reddish Circle about the MOON at the Full, denotes *much Wind*.

Another Sign of arising *Tempests*, is when the Brightness of the smaller STARS is on a sudden obscur'd: For the Upper Regions of the Air perceive the Collection of the Matter of *Tempests* and Winds before the Air here below. *Cæli quidem Murmur non dubiam habet significationem*, says PLINY. And therefore the Obscuring of the Smaller STARS, is a Sign of *Tempests* following. (*Vid.* Lord BACON's *Inquisitio de Ventis*.) Thus again PLINY—*Cum repente STELLARUM Fulgor obscuratur, & id neque nubilo, neque caligine, Pluvia aut graves denunciantur Tempestates.*

Also METEORS (or, as Common People call them, STARS-shooting) spreading a

100 *Signs of arising Tempests,*

long Train of Light, fore-run *Winds* that will soon ensue. Thus VIRGIL ;

Sæpè etiam STELLAS, Vento impendente, videbis,
Præcipites Cælo labi, Noctisque per Umbram
Flammarum longos à tergo albescere tractus.

i. e.

*And oft before Tempestuous Winds arise
The Seeming-STARs fall headlong from the Skies,
And shooting thro' the Darknes, gild the Night
With sweeping Glories, and long Trails of Light.*

Hence PLINY ;

Discurrere STELLÆ videntur interdum, *Ventique*
protinùs sequuntur, in quorum Parte ita præfagivere.

Si volitare plures STELLÆ videbuntur, quo feruntur albescentes, *Ventos* ex iis Partibus nunciabunt.

Aut si cursitabunt, certos : Si id in pluribus Partibus fiet, inconstantes *Ventos* effudent.

*Signs of arising Tempests from the CLOUDS
and SEA.*

SMALL scatter'd CLOUDS in the *South-West*, that fly High, lie as it were in Ridges, and seem not to move, engender *Winds*, often producing *Whirlwinds*.

PLINY (*Nat. Hist.* L. xviii. c. 79.) says,

NUBES cum sereno Cælo feruntur, à quâcunque Parte id fiet, expectentur *Venti* : Si eodem loco globabuntur, appropinquante SOLÈ discutientur. Et hoc si ab *Aquilone* fiat, *Ventos* : Si ab *Austro*, imbres

por-

from the CLOUDS and SEA. 101

portendent. SOLE Occidente si ex utraque Parte ejus Cœlum petent, *Tempestatem* significabunt.

Est & AQUARUM significatio. *Mare* si tranquillum in portu à cursu stabit, & murmuraverit intra se, *Ventum* prædicit. Littora Ripæque si resonabunt tranquillo, *asperam Tempestatem* : Item *Maris* ipfius tranquillo sonitus, Spu-mæ-ve dispersæ, aut Aquæ bullantes. Sæpè & silentio intumescit *Mare*, flatuque altius solito jam intra se esse *Ventos* fatetur.

i. e.

When CLOUDS move about in a clear Sky, from what Quarter soever they come, you may expect Winds. If they gather together in the same Place, they will be dispers'd by the approaching SUN. And if these CLOUDS come out of the North-East, they foretel Wind : But out of the South, Rain. But if they come from either Quarter at Sun-set, they foretel a Tempest.

The WATERS likewise as well as the Skies, afford us Prognostications of the Weather. If the Sea-Shoar be calm, and the Main troubled, it foretels Wind. But if the Shoars be troubled whilst there is a Calm at Sea, it foretels a Severe Tempest, as does the Noise of its Waves in a Calm, its Foam, and Bubbles. The Pulmones Marini (tho' accounted Senseless Fishes) give Notice to Mariners of approaching Storms that will last several Days. Often-times the Sea begins to be rough, and the Waves swell and rise even in a Calm, and there is a brisker Gale of Wind stirring than ordinary, which shews that there is a Tempest arising.

Give me leave here to add another Sign of *Tempests* arising, and that is the Murmuring Noise of THUNDER from the North.

Signs

Signs of Tempests Ceasing.

A Hafty Shower of Rain falling when the *Wind* has rag'd for some Hours, soon allays it.

If the Water ruckles much, and frequent Bubbles arise, the *Storm* is of a short Continuance.

If the Bird, call'd the *Halcyon* or *Kingfisher*, attempts the Seas when the *Wind* blows hard, 'tis a Sign of its abating.

The merry Chirriping of *Sparrows*, and *Moles* coming out of their Holes, are Signs of *Storms* ceasing.

Signs of THUNDER and LIGHTNING.

IT has been the Observation of those that have had many Years Experience of the Weather, that, when the *Wind* in the Summer Time has been *South* two or three Days together, and it grows very Hot ; and when you see *Clouds* arise with great White Tops like Towers, as if one *Cloud* were on the Top of another, and join'd together with Black on the Nether Side, that then it is like to be THUNDER and RAIN suddenly in many Places.

If

Signs of Thunder and Lightning. 103

If there arise two such *Clouds* with *Thunder* in them, the one on the one Side of you, and the other on the other, then beware.

Another Sign of approaching *Thunder*, are *Meteors* shooting in the Night in Summer-time, for they shew the Air to be inflam'd with much Heat, and consequently that *Thunder* and Lightning will ensue.

Likewise many *Chops* and *Clefts* in the Ground, shew that abundance of Nitrous and Sulphureous Vapours have been exhal'd from the Earth, and got up amongst the Clouds, and there being impatient of Restraint, after long struggling, and rumbling, at last take Fire and burst through with a great Noise, which we call THUNDER, and a sudden Flash which we call LIGHTNING, which are both instantaneous, tho' the one is Seen before the other is Heard, because the Sense of Seeing is quicker than that of Hearing.

If no *Clouds* appear in sultry Weather, and the SUN sets Red and Fiery, great Flashes will appear in the *North* and *North-West*, which is call'd *Fulgetrum*, or *Lightning without Thunder*; because
meeting

104 *Signs of Thunder and Lightning.*

meeting with no Opposition, tho' springing from the same Cause, the Noise is not heard. PLINY says,

Cum Æstate vehementius tonuit quàm fulsit, *Ventos* ex eâ parte denunciat: Contra, si minus tonuit, *Imbrem*. Cum sereno Cœlo *Fulgetræ* erunt & *Tonitrua*, adhiemabit. Atrocissimè autem, cum ex omnibus quatuor Partibus Cœli *fulgurabit*. Cum ab *Aquilone* tantùm, in posterum Diem *Aquam* portendit. Cum à *Septentrione*, *Ventum* eum. Cum ab *Austro*, vel *Coro*, aut *Favonio*, Nocte Serenâ fulguraverit, *Ventum* & *Imbrem* ex iisdem Regionibus demonstrabit. *Tonitrua* matutina *Ventum* significant, *Imbrem* Meridiana.

i. e.

When in the Summer-time it Thunders more than Lightens, from that Quarter you may expect Winds: On the Contrary, when it Thunders less, you may expect a Shower. When in a Quiet Air it both Thunders and Lightens, it will be Bad Weather: But very Bad when the Lightning comes from all the four Quarters of the Sky. When it comes only from the North-East, it foretels Rain the next Day. When it comes from the North, it foretels a North Wind. When in a Quiet Night the Lightning comes out of the South, North-West, or West, it foretels both Rain and Wind from those Quarters. Thunder in a Morning foretels Wind; at Noon, Rain.

VIRGIL,

At *Boreæ* de parte truci cum *Fulminat*, & cum *Eurique* *Zephyrique* tonat *Domus*; *Omnia* *plenis* *Rura* *natant* *fossis*, atque *omnis* *Navita* *Ponto* *Humida* *vela* *legunt*——

i. e. *But*

Signs of Thunder and Lightning. 105

i. e.

But when the winged THUNDER takes his Way
From the cold North, and East and West engage,
And at their Frontiers meet with equal Rage,
The Clouds are crush'd, a Glut of gather'd Rain }
The hollow Ditches fills, and floats the Plain, }
And Sailors furl their dropping Sheets amain.

Now the Cause of *Thunder and Lightning* assign'd by Dr. WALLIS (*Philos. Transf.* N^o 231. p. 655.) is as follows —
Thunder and Lightning (says he) are so very like the Effects of fir'd *Gun-powder*, that we may reasonably judge them to proceed from like *Causes*. The principal Ingredients in *Gun-powder* are *Nitre* and *Sulphur* (the Admission of Charcoal being chiefly to keep the Parts separate for the better kindling of it). So that if we suppose in the Air, a convenient Mixture of *Nitrous* and *Sulphureous* Vapours, and those by Accident to take Fire, such Explosion may well follow, with such Noise and Light, as in the firing of *Gun-powder*. And being once kindled it will run from Place to Place as the Vapours lead it, as in a Train of *Gun-powder*, with like Effects.

O

This

106 *Signs of Thunder and Lightning.*

This *Explosion*, if High in the Air, and far from us, will do no Mischief, or not considerable; like a Parcel of *Gun-powder* fir'd in the open Air, where is nothing near to be hurt by it: But if near to us (or amongst us) it may kill Men or Cattle, tear Trees, fire Gun-powder, break Houses, or the like; as Gun-powder wou'd do in like Circumstances. This Nearness or Farness may be estimated by the Distance of Time between Seeing the Flash of *Lightning*, and Hearing the Noise of *Thunder*. For tho' in their Generation they be Simultaneous; yet (Light moving faster than Sound) they come to Us successively. I have observ'd that commonly, the *Noise* is about 7 or 8 Seconds after the *Flash* (*i. e.* about Half a Quarter of a Minute); but sometimes much sooner, in a Second or two, or less than so, and almost immediately upon the *Flash*. And at such Time, the *Explosion* must needs be very near us, or even amongst us. And in such Cases, I have (more than once) presag'd Mischief, and it has happen'd accordingly.

Now,

Signs of Thunder and Lightning. 107

Now, that there is in *Lightning* a *Sulphurous* Vapour is manifest from the *Sulphurous* Smell which attends it, and a Sultry Heat in the Air which is commonly a Forerunner of *Lightning* soon after. And that there is also a *Nitrous* Vapour with it, we may reasonably judge, because we do not know of any Body so liable to a sudden and violent *Explosion*.

Clouds like *Woolly* Fleeces appearing High, and moving Heavily, having in the Middle a Darkish Pale, and the Edges White, carry *SNOW* in them, which in Winter frozen in Sheets by Cold *East*, *North-East*, and *North-West* Winds, pressing hard on the Atmosphere (no longer able to bear them up) shiver in the Fall and break into Flakes. If the *Clouds* be press'd nearer the Earth, the Vapours so frozen are grosser, and the Flakes larger; but more remote, thinner, and so fall in little Flakes.

The *SUN*'s looking Pale at its Rising; the much Lowing of *CATTLE* in the Fields; the Croaking of *RAVENS*; and *BIRDS* flagging their Wings, are all Signs of approaching *SNOW*.

Mr. MORTON in his *Nat. Hist. of Northamptonshire*; p. 348, says, that there are some previous Alterations in the lower Part of the Air upon the Approaches of a *Thunder-Cloud*, as there are before Rain and Snow; tho' we have not any Weather-Glasses invented to discover them, we are assur'd by the nicer Sense and Sagacity that is in some Brute Animals, and particularly in some of our Horses, which before a *Thunder-Cloud* discharges, will often shake their Heads, turn about with great Uneasiness; but when the Clap is over, they are Easy as before.

Signs of HAIL.

IF the SUN at its Rising cast a glittering Light as if it reflected on some Lucid Matter, tho' few or no Clouds appear at that Time; the Vapours are condens'd in the Cold Region, and forerunning into Clouds that will scatter violent HAIL.

If (in the Morning) the *Eastern Skies*, before the SUN-rising, look Pale; and refracted Rays appear in thick Clouds, great Storms of HAIL will ensue to the great Damage of Corn and Fruits.

Thus

Thus VIRGIL;

Aut ubi sub Lucem densa inter Nubila sese
Diverſi rumpent Radii, aut ubi *pallida* ſurget
Tithoni croceum linquens *Aurora* cubile;
Heu, malè tum mitis defendet *Pampinus* Uvas,
Tam multa in *Tectis* crepitans ſalit horrida
GRANDO.

i. e.

Or if Aurora with Half-open'd Eyes,
And a Pale ſickly Cheek, ſalute the Skies,
How ſhall the Vine, with tender Leaves defend
Her teeming Cluſters, when the Storms deſcend,
When riddy Roofs and Tiles can ſcarce avail
To bar the Ruin of the ratling HAIL.

PLINY ſays,

Si Cacumina Montium gravida fient, Nube candi-
cante (quod vocant *Tempeſtatem Albam*) GRANDO
imminebit.

If the *Clouds* look Fleecy, Duſky, White
inclining to Yellow, and move but Heavi-
ly, tho' the Wind be pretty Rough, the
Vapours compoſing them are engender'd
and frozen, and ratling HAIL enſues.

If the *Clouds* appear of a *Whitiſh Blue*,
and expand much, it will be ſmall HAIL
or Drifling (*i. e.* frozen Miſts); for that
happens in the Winter or Spring, when it
cannot be carried High enough to be con-
dens'd by a greater Quantity of Cold, be-
cauſe the refracted Rays of the SUN are
but

but weak, and this appears by a Curdling in the *Clouds* as they Rise, and in Appearance expand themselves.

White Clouds in the Summer-time are a Sign of HAIL, but in Winter-time they are a Sign of SNOW, especially when we perceive the Air to be a little Warm, occasion'd by some Warm Eruptions out of the Clouds.

The Reverend and Learned Mr. SAUL (in his Hist. and Philosoph. Account of the Barometer) gives this ingenious Account of the Formation of SNOW and HAIL, p. 23. — Out of the Magazines of Vapours floating and supported in the Air (according to the different Changes they undergo from the Season of the Year, the Temper of the Winds, and the Warmth or Coldness of the Superior Regions) the several Kinds of Aqueous Meteors are form'd and supplied, which under so many different Appearances fall back upon the Surface of the Earth. Such Vapours as are rais'd by the declining SUN, or hang near the Surface of the Earth, being condens'd by the Coldness of the Nights, in the Summer fall back in Dews, and in the

Signs of HAIL. 111

the Winter in *Hoar Frosts*. In what we call a *Black Frost*, either the Rise of Vapours is quite intercepted, or rather they are rais'd too High to be reach'd and precipitated by the Cold below. When the Vapours approaching nearer to each other, are frozen in the Clouds, and broken by the Resistance and Fluctuations of the Air, or the Cold Winds passing thro' them, they then fall down in Flakes of SNOW. When the Vapours are beginning to run into small Drops, and are precipitated by the Cold Above, before they are completely form'd, they then fall down in *Misting Rains*, or if frozen, in *Sleet*. And as the ordinary Drops of *Rain*, freezing in their Descent, form HAIL; so whenever they happen afterwards in their further Descent downwards, to pass thro' a Cloud of SNOW, they encrease in Bulk, and gathering, in a Literal Sense, as a *Snow-ball*, form those larger *Hail-stones* (of six or more Inches in Circumference) of which we often read, and sometimes with Surprise Admire and Observe.

Now

Now as to the Cause or Generation of HAIL (which is very often an Attendant of *Thunder* and *Lightning*) Dr. WALLIS (in *Philos. Transf.* N^o 231. p. 657) gives us this Account — 'Tis well known (says he) in our Artificial Congelations, that a Mixture of *Snow* and *Nitre* (or even common Salt) will cause a present and very sudden *Congelation of Water*. And the same in Clouds may cause that of *Hail-stones*. And the rather, because there seems somewhat like *Snow*, rather than *Ice*, in the midst of them. And as to those in particular so very large (as to weigh Half a Pound; or three Quarters of a Pound) supposing them to fall from so great a Height, as 'tis manifest they did by the Violence of their Fall; 'tis very possible, that, tho' their first Concretion, upon their sudden *Congelation*, might be but moderately Great as in other *Hail*, yet in their long Descent, if the Medium thro' which they fall were alike inclin'd to *Congelation*, they might receive a great Accession to their Bulk, and divers of them incorporate into one.

Signs

Signs of Cold and Frosty Weather.

THE SUN's Setting Red in a Mist, and broader than usual, and a White Fog creeping low in Marshy Ground, shew the Air is condensing into *Cold*.

The MOON shining Bright, with sharp Horns after the Change, shews the Air is rarifying, and that Cold Winds will soon set in to freeze the Earth.

Also the STARS looking Bright and twinkling much, denote a Cold Air, engendering *Frosts*.

The Sky seeming fuller of STARS than usual, and the Wind suddenly shifting to the *East*, or *North-East*, after the Change of the *Moon*, in the Winter, denotes a settling FROST of long Continuance.

Sea-Pyes flocking from Salt to Fresh Waters ; also *Starlings*, *Feldefares*, and other Birds of a Hot Nature, hast'ning in great Flocks from the *Northern* to the *Southern* Climates ; and *Swallows* going away sooner than usual, denote a *Cold Season* to ensue.

P

Thus

114 *Signs of Cold and Frosty Weather.*

Thus Mr. DRYDEN in his *Hind and Panther* ;

*The Swallows (privileg'd above the rest
Of all the Birds, as Man's familiar Guest)
Pursue the SUN in Summer brisk and bold,
But wisely shun the persecuting Cold.
When frowning Skies begin to change their Chear,
And Time turns up the wrong Side of the Year,
They seek a better Heav'n and warmer Climes.
But whether Upward to the MOON they go,
Or dream the Winter out in Caves Below,
Or hawk at Flies elsewhere, concerns us not to know.* }

Owls Hooping Often with a Lowder Note than usual, in the Winter-time, signify approaching FROST.

Likewise Little Clouds hovering Low in the North, when none appear any where else, fore-run Cold freezing Winds and Snow. PLINY says,

Arcus cum sunt duplices, Pluvias nunciant : à Pluviis, Serenitatem non perinde certam.

Circuli novi circa Sidera aliqua, Pluviam.

i. e.

*The Rain-bows being of two Sorts, foretel Rain :
But from Rain you can't so easily prognosticate Fair Weather.*

New Circles about some of the Stars, are Signs of Rain.

The SUN's looking Waterish at its Rising, is one Sign that the FROST will break.

Also

Signs of Hard Winters. 115

Also the SUN's Setting in Bluish Clouds, and casting refracted Rays into them is another.

The STARS looking Dull upon the Matter, and the MOON's Horns blunted, bid the FROST prepare to be gone.

The WIND having held long, and extremely shifting, brings a Relaxation, if not a thorough *Thaw*.

When the AIR is either intensively Cold, or intensively (*i. e.* excessively) Hot, 'tis seldom lasting : Therefore when the *Air* in the Summer-time is intensively Hot, we say, *It is too Hot to Hold* : So likewise when the *Air* in the Winter-time is intensively Cold, we may say, *'Tis too Cold to Hold* : Because *Nullum Violentum est diuturnum*, *Nothing that is Violent is lasting*.

Signs of Hard Winters.

LORD BACON's Prognosticks of Hard Winters, are as follow :

The Predictions of Cold and Long *Winters*, and Hot and Dry *Summers*, are good to be known, as well for the

P 2

Discovery

116 *Signs of Hard Winters.*

Discovery of the Causes, as for divers Provisions. If *Wainscot* or *Stone*, that have been use to *Sweat* (as they call it) be more Dry in the Beginning of *Winter*, or the Drops of Eaves of Houses come down more slowly than they use to do, it portends a *Hard and Frosty Winter*. The Cause is, for that it shews an Inclination of the Air to Dry Weather, which in *Winter* is ever join'd with *Frost*.

Generally a *Moist and Cold Summer* portends a *Hard Winter*. The Cause is, for that the Vapours of the Earth are not dissipated in the Summer by the SUN, and so they rebound upon the Winter.

A *Hot and Dry Summer*, and especially if the Heat and Drought extend far in *September*, portends an Open Beginning of Winter, and Cold to succeed towards the latter Part of the Winter, and the Beginning of the Spring. For till then the former Heat and Drought bear the Sway, and the Vapours are not sufficiently multiply'd. PLINY says,

Autumni Serenitas Ventosam Hyemem facit.
i. e.

A Mild Autumn foretels a Hard Winter.

But

Signs of Hard Winters. 117

But an Open and Warm *Winter* portends a Hot and Dry *Summer* : For the Vapours disperse into the Winter Showers ; whereas Cold and Frost keep them in, and transport them into the late Spring and Summer following.

Cold Dews, and Morning *Rymes* about *St. Bartholomew-tide*, and *Hoar-Frosts* in the Morning about *Michaelmas-tide*, foretel a *Hard Winter*.

Other Signs of a *Hard Winter* may be fetch'd from the CLOUDS and STARS.

Thus PLINY ;

Si antè SOLIS-Ortum NUBES globabuntur, Hyemem *Asperam* denunciabunt.

Sunt in *Signo Canceri* duæ STELLÆ parvæ, *Afelli* appellatæ, exiquum inter illas spaciū obtinente *Nubeculâ* quam *Præsepe* appellant : Hæc cum Cœlo fereno apparere defierit, atrox *Hyems* sequitur. Si alteram earum *Aquiloniam* caligo abstulit, *Auster* sævit : Si *Austrinam*, *Aquilo*.

i. e.

If the CLOUDS gather before SUN-Rising, they foretel a Hard Winter.

There are in the Sign of Cancer two little STARS call'd *Afelli*, and a little CLOUD, that they call *Præsepe*, takes up a small Space between them : This CLOUD, when it disappears in a clear Sky, is a Sign of a Hard Winter. If one of those little STARS that points towards the North be obscur'd, the South-Wind will

118 *Signs of Hard Winters.*

will be boisterous : If the other that points towards the South be obscur'd, then the North-Wind will be boisterous.

Other Signs of a *Hard Winter* we have from BIRDS. *Migratory Birds*, that use to change Countries at certain Seasons, if they come Earlier, do shew the Temperature of Weather according to that Country from whence they came : as the *Winter BIRDS* (namely *Woodcocks, Feldes-fares, Snipes, &c.*) if they come Earlier, and out of the *Northern* Countries, with us foretel *Cold Winters*. And if it be in the same Country, then they shew a Temperature of Season like that Season from which they come, as *Swallows, Nightingales, Cuckoes, Marlots, and Batts*, that come towards Summer, if they come Early, foretel a Hot Summer.

It is an Observation among Country People, That those Years, in which we have Store of *Heps and Haws*, do commonly portend *Cold Winters* ; and they ascribe it to *Providence*, that reaches to the Preservation of *Birds* in such Seasons. The Natural Cause also may be the Want of Heat and Abundance of Moisture

in

Signs of Hard Winters. 119

in the precedent Summer, which puts forth those Fruits, and must needs leave great Quantity of Cold Vapours not dissipated, which causes the Cold of the ensuing *Winter*.

Some People make their Observations from NUT-TREES : If in the Beginning of the Year they Flower much, it foretels a Plentiful Harvest, Sickly Autumn, and a *Cold Winter*.

Other nice Prognosticators make their Observations from what they call OAK-APPLES, which are the Galls and Balls or Excrecences found on the Leaves and Branches of divers Vegetables, such as the Oak, the Willow, and the Briar ; and also on some Plants, as Nettles, Ground-Ivy, &c. These *Balls* are a Repository to a particular Sort of Insect all the Winter in its Infant Vermicular State ; for the Eggs laid up and hatch'd the Summer before, do not come to mature Insects till the Spring following. In the *Autumn* these *Balls* fall down with their Leaves to the Ground, and the Insect inclos'd in them is there fenc'd against the Winter Frosts : And then is the Time for making Observations. If they

120 *Signs of Hard Winters.*

they are found to be Dry, they are said to foretel a Dry *Winter* ; if Moist, a Wet *Winter* ; if early Ripe, a very *Sharp Winter* will quickly follow. But if you cut these *Balls* and find no Insects within, it denotes a Scarcity of the Fruits of the Earth the ensuing Year. For commonly a great *Fly*-Year proves a great *Fruit*-Year, both being owing to the kind Influence of the SUN, which by its Congenial Warmth both brings to Perfection the Eggs of Insects, and brings to Maturity the Fruits of the Ground.

I shall mention but one more Observation and Prognostic of a *Hard Winter*, and that is your *Igneous METEORS*, call'd *Ignes Fatui*. These are weak Exhalations kindled by a violent Motion in a Cold Night, embodied as it were in Bladders, receiving their Motion from that of the Air ; so that when these Nocturnal Luminaries, moving in the Lowest Regions of the Air, meet with any Man, they are apt to follow his Motions, and so lead him out of the Way, and therefore call'd *Ignes-Fatui*, because they make *Fools* of People.

Now

Signs of Pestilential Seasons. 121

Now when these Exhalations rise much, which they do in Marshy Grounds, towards the Beginning of Winter, they foretel a *Hard Winter*, but a *fruitful Summer*, because the Hovering of these *Meteors* near the Earth, shews that the Air is condensing and growing cold, which Coldness hinders the Ascension of the Vapours, and keeps the Earth warm in the Winter, by incrustating its Superficies with gentle Frosts, and as it were carefully locking up its Unctious, Nitrous, and Fertile Parts, and keeping them from Evaporation.

Signs of Pestilential Seasons.

HIPPOCRATES says, If the Year prove to be for the most part *Dry*, acute Fever must be expected. The Reason of which is plain, for by excessive Dry Weather, the Body is drained of its natural Moisture, so that nothing remains behind but Viscid and Dry Humours, unfit for Circulation. The *Tubuli* of the Skin are parch'd up, and Perspiration hinder'd, whence proceed innumerable Distempers, Inflammations and acute Fevers.

Q

If

122 *Signs of Pestilential Seasons.*

If the *Winter* Season (says the same Author) be *Dry* and *Cold*, and the Spring *Rainy*, and subject to *Southerly* Winds, it must necessarily fall out that in Summer, acute Fevers, Rheums in the Eyes, and bloody Fluxes happen, especially to those who are of a Moist Constitution. The Reason of which is this, By great Driness and Cold, the Secretory Ducts are contracted, and the Liquids grow viscid, because Perspiration is hereby hinder'd. For too great Cold hinders Perspiration, and contracts the Fibres as much as too great Heat. Which Viscidity, being dissolv'd and fomented by the supervening Moist Season, is dispos'd to Putrefaction.

But if the Winter be *Southerly*, *Hot*, and *Rainy*, and the Spring *Northerly* and *Dry*, then it is often an Occasion of Abortions in Women, or else the Production of Weak and Diseas'd Children: To others an Occasion of Bloody-Fluxes, and Inflammation of Eyes: And to Old People, Rheums and Catarrhs, which shortly kill them. For by such an unseasonable Warmth and Rain, the Bodies, especially of Women, are render'd Lax, Heavy and Infirm.

And

Signs of Pestilential Seasons. 123

And this is the Reason why such a Season is so pernicious both to very Young and Old People. But Middle-ag'd People may overcome it, by the Help of their strong Constitution to digest such Viscid and Putrid Humours, as are occasion'd by such a Heavy Air.

If the Summer be *Dry* and the Wind *Northerly*, but the Autumn *Rainy*, and the Wind *Southerly*, then violent Pains in the Head, Coughs, Hoarsness, and Rheums, and to some Consumptions, are to be expected in the Winter following. For by the Cold of the Summer and Heat of Autumn, Human Bodies grow Costive, Perspiration is obstructed, and in Time the Upper Parts of the Body, especially the Head, are over-charg'd with Viscid Humours, which are the Causes of such Distempers of the Head and Lungs.

My Lord BACON says, it has been observ'd, that those Years are Pestilential and Unwholesome, when there are great Numbers of *Frogs*, *Flies*, and *Locusts*, &c. The Cause is plain, for that those Creatures being ingender'd of Putrefaction, when they abound they shew a great Dis-

124 *Signs of Pestilential Seasons.*

position of the Air to breed Diseases. But here this Great *Naturalist* err'd; for Spontaneous and Equivocal Generation is a Doctrine long since exploded. *Omnia ex Ovis*; No Animals but from Eggs. Putrefaction has no Seeds of Life in it self, How then can it give Life? *Nil dat quod in se non habet.*

He tells us likewise, that it was observ'd in the Great *Plague* in 1665, that there were seen in divers Ditches and Low Grounds about *London*, many *Toads* that had Tails two or three Inches long at least, whereas *Toads* usually have no Tails at all; which argues a great Disposition to Putrefaction in the Soil and Air. Here I suppose this Great Man impos'd upon, and to have have taken his *Long-tail'd Toads* upon Trust; and we may suppose the Imposer had never seen any *Tadpoles* before.

To this suspicious Story of *Toads*, give me leave to add a true Story of *Locusts* in the Time of *Plague*. The *Plague* happens frequently in the Country of the *Cossacks*, or *Ukrani* (in the Southern Parts of the States of *Poland*) where, in dry Summers,

Signs of Pestilential Seasons. 125

mers, they are infested with such Swarms of *Locusts*, driven thither by an *East* or *South-East* Wind, that they darken the Air in the fairest Weather, and devour all the Corn of that Country, laying their Eggs in Autumn, and then dying : But the Eggs, of which every one lays two or three Hundred, hatching the next Spring, produce again such a Number of *Locusts*, that then they do more Mischief than before, unless Rains fall, which kill both *Eggs* and *Insects*, or unless a strong *North* or *North-West* Wind arise, which drives them into the *Euxine* Sea.

I shall only subjoin one Account more of an odd Sort of *Maggots* found in the Time of Plague, given by Dr. M. LISTER (*Phil. Transf.* N. 160. p. 595.) — In the Harvest-time 1666. (says he) the Sicknes then raging at *Cambridge*, at *Bassenburn* in *Cambridgeshire*, there were Millions of *Maggots* on the *Corn Lands* ; and in their Barns too, the Floor wou'd be cover'd with them that fell from the Carts. The *Maggots* were about half an Inch long, no thicker than a *Pigeon's Feather*, of a White Colour, somewhat shaded with an
Isabella

126 *Signs of Pestilential Seasons.*

Isabella or faint yellowish Stripes, the Length of the *Worm*: they had fourteen Feet, after the manner of many *Caterpillars*, and I was almost confident would have produc'd some sort of *Moth*. I took up about a Score of them and put them into a Box; but they immediately offend-ed me with an ungrateful and strong Stink, which yet is not usual to the Caterpillars-kind. After two Days I rid my self of them, and only observ'd, that the *Excrements* which they voided, were little hard *Pellets*, of pure white Flour like that of Barley.

Some Years after this there was such a Swarm of certain sort of *Insects* in *New-England*, that for the Space of 200 Miles they poison'd and destroy'd all the Trees of the Country, there being found innumerable little Holes in the Ground out of which those *Insects* broke forth in the Form of *Maggots*, which turn'd into Flies that had a kind of *Tail* or *Sting* which they struck into the Tree, and thereby en-venom'd and kill'd it.

Another Sign of the Pestilential Infection of the Air, and consequently of Sickly Seasons,

Signs of Pestilential Seasons. 127

Seasons, is the *Roots* in the Earth, such as *Carrots* and *Parsnips*, which have been observ'd to be more Sweet and Luscious in Infectious Years than others.

Other Signs of *Pestilential* Seasons we have from *Great and Early Heats* in the Spring-time (particularly in *May*) without Winds.

A Dry *March* and a Dry *May*, portend a wholesome Summer, if there be a Showry *April* between; but otherwise it is a Sign of a *Pestilential* Year. And generally Years with little Wind or Thunder portend the same.

Great *Droughts* in Summer, lasting till toward the End of *August*, and some gentle Showers upon them, and then some Dry Weather again, do portend a *Pestilential* Summer the Year following: for about the End of *August* all the Sweetness of the Earth which goes into Plants and Trees is exhal'd (and much more if the *August* be Dry) so that nothing then can break forth of the Earth but a gross Vapour, which is apt to corrupt the Air; and that Vapour by the first Showers, if they be gentle, is releas'd, and comes forth

128 *Signs of Pestilential Seasons.*

abundantly. Therefore they that come abroad soon after those Showers, are commonly taken with Sickness. And in *Africa* no body will stir out of Doors after the First Showers. But if the Showers come vehemently, then they rather wash and fill the Earth, than give it leave to break forth presently. But if Dry Weather come again, then it fixes and continues the Corruption of the Air upon the First Showers begun, and makes it of *ill Influence* even to the next Summer, except very Frosty Weather discharge it, which seldom succeeds such *Droughts*.

The Lesser Infections of the *Small-pox*, *Purple-Fevers* and *Agues* in the Summer precedent, and hovering all Winter, do portend a great *Pestilence* in the Summer following : for Putrefaction does not arise to its Height at once.

My Lord BACON advises this Experiment, to lay a Piece of *Raw Flesh* or *Fish* in the open Air for Trial, and if it Putrefy quickly, 'tis a Sign of a Disposition in the Air to *Putrefaction*. And because you cannot be inform'd, whether the *Putrefaction* be quick or late, except you compare

Signs of Pestilential Seasons. 129

compare this Experiment with the like Experiment in another Year ; it were not amiss in the same Year, and at the same Time, to lay one Piece of Flesh or Fish in the Open Air, and another of the same Kind and Bigness within Doors : For I judge (says he) that if a General Disposition be in the Air to *Putrefy*, the Flesh or Fish will sooner Putrefy Abroad where the Air is stronger and has more Power, than in the House where it is weaker and has less, being many ways Corrected. And this Experiment wou'd be best made about the End of *March* ; for that Season is the likeliest to discover what the Winter has done, and what the Summer following will do upon the Air. And because the Air no doubt receives great Tincture and Infusion from the Earth, 'twere good to try that Experiment of *raw Flesh* both upon a Stake of Wood and upon the Superficies of the Earth, says my Lord BACON.

But there is a more Modern Experiment than this, and that is by tying a Bit of Raw Flesh to the Tail of a Paper Kite, and keeping it up a great Height in the Air for a considerable Time.

R.

It

130 *Signs of Pestilential Seasons.*

It has been noted by the Ancients, that *Southern-Winds* blowing much *without* Rain, do cause a *Feverish* Disposition of the Air ; but *with* Rain, not. The Cause is, for that *Southern-Winds* do of themselves qualify the Air to be apt to cause *Fevers* ; but when Showers are join'd, they do refrigerate in part, and check the Sultry Heat of the *Southern Wind*. Therefore this holds not in the Sea-Coasts, because the Vapours of the Sea without Showers, do refresh.

The Cause assign'd to Malignant Epidemical Diseases, particularly the *Plague*, by the Ingenious and Learned Dr. MEAD, is a Hot and Moist Temperament of the Air, which is observ'd by HIPPOCRATES, GALEN, and the General Histories of Epidemical Diseases, to attend those Distempers. *Vid.* MEAD of *Poisons*, Essay V. p. 161. But indeed (says the Reverend and Ingenious Mr. DERHAM, in his *Physico-Theol.*) whether the Cause be this, or Poisonous, Malignant Exhalations (as others think) the Winds are however very salutiferous in such Cases, in Cooling the Air, and dispersing and driving away the Moist

Signs of Pestilential Seasons. 131

Moist or *Pestiferous* Vapours. It is well observ'd (in my Lord HOWARD's Voyage to *Constantinople*) that at *Vienna* they have frequent *Winds*, which if they cease long in Summer, the *Plague* often ensues : So that it is now grown into a Proverb, *That if Austria be not Windy, it is subject to Contagion.* BOHUN of *Wind*, p. 213.

From such Commotions of the Air (says Mr. DERHAM) I imagine it is, that at *Grand-Cairo* the *Plague* immediately ceases as soon as the *Nile* begins to overflow ; altho' Mr. BOYLE attributes it to Nitrous Corpuscles. *Determ. Nat. Effluv.* ch. 4.

Nulla enim propemodum Regio est, quæ non habeat aliquem *Flatum* ex se nascentem, & circa se cadentem.

COMETS likewise are reckon'd amongst the Signs of *Pestilential Seasons.* For *Comets* consisting of a vast Quantity of Hot and Fiery Exhalations, upon their Expiration corrupt the Air with Poisonous Infection, which infects the Bodies of Men and Beasts with Mortal Distempers ; and is not without Reason accounted the Natural Cause of Wars and Commotions in the World ; these Hot Exhalations being too

332 *Signs of Pestilential Seasons.*

apt to heat and blow up the Choleric Temper of Men to Anger and Contention.

Thus VIRGIL Lib. x.

Non Secùs ac liquidà si quando nocte COMETÆ
Sanguinei lugubre rubent, aut SIRIUS Ardor :
Ille *Sitim Morbosque* ferens mortalibus ægris
Nascitur, & lævo contristat lumine Cœlum.

i. e.

*Thus blazing COMETS in the Night appear
In Sanguine Fires, and thus the threatening STAR
Of SIRIUS fills the Air with dismal Lights,
And anxious Men with Plagues and Famines frights.*

MILTON continues,

— A COMET that from his horrid Hair
Shakes Pestilence and War.

EARTH-QUAKES likewise are sometimes Forerunners of *Pestilential* Seasons ; by sending out great Quantities of Noxious Exhalations, Dr. WINCLER gives an Account of a *Murrain* in *Switzerland*, that he thinks was occasion'd by three distinct *Earthquakes* that happen'd in the Space of one Year. On the Borders of *Italy* (says he) a *Murrain* infested the Cattle ; which spread farther into *Switzerland*, the Territories of *Wirtemberg*, and over other *Provinces*, and made great Destruction among them. The *Contagion* seem'd to propagate it self in the Form of a *Blue Mist*,

Signs of Pestilential Seasons. 133

Mist, that fell upon those Pastures where the Cattle graz'd, insomuch that Herds return'd home Sick, and most of them died away in 24 Hours.

To conclude this Chapter : The Signs and Forerunners of the *Plague*, according to LUDOVICUS GARDINIUS, and EBERHARDUS GOCKELIUS, are as follow :

1. If *Spring* and *Summer* have been too *Moist* ; if Winter and Autumn too *Wet*, and not Cold enough.

2. If the *South-Winds* have blown without Tempests or Hurricanes.

3. If the *Air*, for some Time together, *changes often in a Day*, and is sometimes Hot, and then Cold, now Cloudy and then Clear ; yet the Clouds hang low, the Air is Sultry, and the Heavens threaten Rain without any falling.

4. If there be an extravagant Quantity of *Stinking Atoms*, *Insects*, or *Animals*, as of Flies, Frogs, Snakes, *Locusts*, &c. Or if Birds retreat to solitary Places and forsake their Nests.

5. If *Famine* happen, or there be too great Plenty of corrupted Meats : Or if
a Na-

134 *Signs of Pestilential Seasons.*

a Nation be afflicted with Troubles and Poverty, that may throw them into a Consternation : Or if Wars have been among them, and their Dead lie unburied.

6. If unusual Fires or *Comets* have appear'd in the Sky, or strange Meteors seen in the Air, making great Alterations in Natural Bodies.

7. If *Small-pox*, *Putrid Fevers*, and such-like Contagious Diseases reign, whereby the Air is often Corrupted.

8. If the *Plague* rages in a neighbouring Country, we are to be fearful of its spreading Influence, since 'tis easy to be communicated either by Air, infected Goods, or Persons.

For Contagion is produc'd by an Efficient Cause ; which Efficient Cause is either a Venomous Putrefaction or Pestilential Infection of the Air, which acts Internally and Externally upon a Human Body, either by entering the Pores, or passing the Contagious Particles into the Lungs, and so communicating its deadly Ferment to the Blood and Humours.

Signs

Signs of Scarcity and Dearth.

AT the Rise of the River *Kennet* in *Wilts*, which is between *West-Kennet* and *Overton*, there are Stones like Rocks (from whence there is a Village call'd *Rock-ley*) between which there sometimes breaks out Water on a sudden in the manner of a Land-Flood, which the Common People call *Hunger-bourn* (i. e. a Rivulet of Hunger) because it is commonly the Prognostic of Great *Scarcity*, says CAMDEN. That the sudden Eruption of Springs in Places where they use not always to run, shoud be a Sign of DEARTH, is no Wonder, says Dr. CHILDREY. For these unusual Eruptions (which in *Kent* they call *Nail-bourns*) are caus'd by extreme Gluts of *Rain*, or lasting Wet Weather, and never happen but in Wet Years (witness the Year 1648, when there were many of them); in which Years Wheat and most other Grain thrive not well (for a certain Reason) and therefore a DEARTH succeeded the Year following. The Country Proverb in *Kent* is, *That Drought never makes a*
DEARTH;

136 *Signs of Scarcity and Dearth.*

DEARTH ; which was sufficiently verify'd in the Years 1654 and 1655 when (after that lasting *Drought* that began in 1651, and continu'd till 1655) the Price of Wheat fell to 1 s. 6 d. a Bushel, and other Grain proportionably. And to our Purpose, very remarkable it was in the Year 1654, that several Springs and Rivulets, were quite dry'd up by reason of the precedent *Drought*, which rag'd most in 1651-52-53. As the Head of the *Stour* that rises near *Eltham* in *Kent*, and runs thro' *Canterbury*, was Dry for the Space of some Miles ; and the like happen'd in the Stream that crosses the Road-way between *Sitting-bourn* and *Canterbury* at *Ospring* near *Feverisham*, which at other Times ran with a plentiful Current, but then wholly fail'd, like the Brooks in *Israel* in *Ahab's* Time.

There is likewise near *St. Alban's* in *Hertfordshire* a Brook call'd *Wenmere* or *Womere*, which never breaks out but it foreruns DEARTH and Scarcity of Corn.

The Rising of a *Bourn* or Stream near *Croyden* in *Surrey* presages DEARTH or the *Plague* ; and it has been observ'd to fall out so. The Rising of *Bourns* in
Places

Signs of Scarcity and Dearth. 137

Places where they run not always, is caus'd by great *Wet* Years, which (according to HIPPOCRATES) are generally the most Sickly; and if they prove Hot as well as Wet (because Heat and Moisture are the great Disposers to Putrification) they prove also Malignant, and for the most part Pestilential. And the Reason why the Rising of this *Bourn* does not always presage the Plague, is because all Wet Years do not prove Hot.

The Reverend and Ingenious Mr. MOR-
TON (in his *Nat. Hist. of Northamptonsh.*
p. 320.) mentions a small Spring of the
Temporary Kind, that presages *Dearth*.
It is of great Note with the Vulgar, and
is call'd *Marvel-like Spring* in *Boughton*
Field, about two Bows-shoot from *Brampton*-
Bridge nigh *Kingsthorp* Road. It
never runs but in mighty Gluts of Wet;
and whenever it does, is thought Omi-
nous by the Country People, who from
the Breaking-out of that Spring, are wont
to prognosticate *Dearth* or the Death of
some Great Person, or very Troublesome
Times. It did not run when I was there,
on *October* 22. 1703. but the foregoing

S

Winter

138 *Signs of Scarcity and Dearth.*

Winter it did, and had not run before of two Years. That Winter was a very wet one, and observable for the Breaking-out of such Springs as these.

There are likewise several *Pools* in *Staffordshire* that presage a DEARTH, either by Rising or Overflowing : Such is *Moss-Pool* near *Moreton* in the Parish of *Aldridge* ; the Rising of the former, and the Exundation of the latter (which generally at other Times is almost Dry) being taken for certain Signs of a DEARTH of Corn. But the most famous is *Hungry-Pit*, not far from *Billington*, which predicts SCARCITY by its Rise upon Sticks set upright in the Mud, which the People place there every one for their own particular Observations ; fore-judging the Rise or Fall of Corn in Markets by the Rise or Fall of the Water on these Sticks, and so either Keeping or Vending it accordingly : wherein it so little regards the Quality of the Weather, that it overflows sometimes in the greatest DROUGHTS. By which Remarks some have advanc'd their Fortunes considerably. The Reason of this Dr. PLOT resolves into the Mediation of Springs. But

Signs of Continuance of Weather. 139

But of all the Signs of SCARCITY and DEARTH, your violent *Earthquakes* are the surest. For the Earth having emitted so much of its fertile Qualities in such violent Evaporations, a SCARCITY must ensue not only for the Present, but for some Years After.

Signs of Continuance of Weather.

SOME that have been very Curious Observers of the Weather, have laid down this as a pretty good Rule to be enfur'd of the Weather for four or five Days together (if a Man was to go a Journey or so) and not fail one time in ten; which is this, When the *Wind* has been in the *North*, or *North-East*, two Days without Rain, and continues in the same Point the third Day, then one may venture to go a Journey, if the Air be clear: Because one may wait a Month or two for a Week of Fair Weather together, and not have it. Therefore this Rule is of Use every Week for a single Day or two.

Signs of the Weather from the Weather-glasses.

THE principal Observations made upon the *Barometer* by the Learned Dr. HALLEY (*Philos. Trans.* N^o 181.) from the different Heights of *Mercury* at several times, are these ;

The First is, That in Calm Weather, when the Air is inclin'd to Rain, the *Mercury* is commonly Low.

2. That in Serene good Settled Weather, the *Mercury* is generally High.

3. That upon very great Winds, tho' they be not accompanied with *Rain*, the *Mercury* sinks lowest of all, with relation to the Point of the Compass the Wind blows upon.

4. That, *cæteris paribus*, the greatest Heights of the *Mercury* are found upon *Easterly*, and *North-Easterly* Winds.

5. That in Calm Frosty Weather the *Mercury* generally stands High.

6. That after very great Storms of Wind, when the *Quick-silver* has been Low, it generally rises again very fast.

7. That

7. That the more Northerly Places have greater Alterations of the *Baroscope* than the more Southerly.

8. That within the *Tropicks* and near them, those Accounts we have had from Others, and my Own Observations at *St. Helena*, make very little or no Variation of the Height of the *Mercury* at all Weathers.

Hence I conceive that the Principal Cause of the Rise and Fall of the *Mercury*, is from the variable Winds which are found in the *Temperate Zones*, and whose great Inconstancy here in *England* is most notorious.

A second Cause is the uncertain Exhalation and Recipitation of the Vapours lodging in the Air, whereby it comes to be at one time more crowded than at another, and consequently Heavier ; but this latter in a great measure depends upon the former. Now from these Principles I shall endeavour to explicate the several Phenomena of the *Barometer*, taking them in the same Order I laid them down : Thus,

1. The *Mercury's* being Low inclines it to Rain, because the Air being light,
the

the Vapours are no longer supported thereby, being become specifically Heavier than the *Medium* wherein they floated ; so that they descend towards the Earth, and in their Fall, meeting with other Aqueous Particles, they incorporate together, and form little Drops of Rain : But the *Mercury's* being at one time Lower than at another, is the Effect of two contrary Winds blowing from the place where the *Barometer* stands ; whereby the Air of that Place is carried both Ways from it, and consequently the incumbent Cylinder of Air diminish'd, and accordingly the *Mercury* sinks ; as for instance, If in the *German Ocean* it shou'd blow a Gale of *Westerly* Wind, and at the same time an *Easterly* Wind in the *Irish Sea* : Or if in *France* it shou'd blow a *Northerly* Wind, and in *Scotland* a *Southerly* ; it must be granted me that that Part of the Atmosphere impendent over *England*, wou'd thereby be exhausted and attenuated, and the *Mercury* wou'd subside, and the Vapours which before floated in those Parts of the Air of equal Gravity with themselves, wou'd sink to the Earth.

2. The

2. The greater Height of the *Barometer* is occasion'd by two contrary Winds blowing towards the Place of Observation, whereby the Air of other Places is brought thither and accumulated ; so that the incumbent Cylinder of Air being increas'd both in Height and Weight, the *Mercury* press'd thereby must needs rise and stand High, as long as the Winds continue so to blow, and then the Air being specifically Heavier, the Vapours are better kept suspended, so that they have no Inclination to precipitate and fall down in Drops, which is the Reason of the Serene Good Weather which attends the greater Heights of the *Mercury*.

3. The *Mercury* sinks the Lowest of all by the very rapid Motion of the Air in Storms of Winds. For the Tract or Region of the Earth's Surface, wherein these Winds rage, not extending all round the Globe, that stagnant Air which is left behind, as likewise that on the Sides, cannot come in so fast as to supply the Evacuation made by so swift a Current ; so that the Air must necessarily be attenuated, when and where the said Winds continue
to

144 *Signs of the Weather*

to blow, and that more or less according to their Violence : add to which, that the Horizontal Motion of the Air, being so quick as it is, may, in all probability, take off some part of the perpendicular Pressure thereof : And the great Agitation of its Particles, is the Reason why the Vapours are dissipated, and do not condense into Drops so as to form Rain, otherwise the natural Consequence of the Air's Rarefaction.

5. The *Mercury* stands the Highest upon an *Easterly* or *North-Easterly* Wind, because in the Great *Atlantic* Ocean, on this side the 35th Deg. of *North* Latitude, the *Westerly* and *South-Westerly* Winds blow almost always Trade ; so that whenever Here the Wind comes up at *East* and *North-East*, 'tis sure to be check'd by a contrary Gale, as soon as it reaches the *Ocean* ; wherefore, according to what is made out in our Second Remark, the Air must needs be heap'd over this *Island*, and consequently the *Mercury* must stand High, as often as these Winds blow. This holds true in *This Country*, but is not a general Rule for others, where the Winds are under

der different Circumstances : And I have sometimes seen the *Mercury Here* as Low as 29 Inches upon an *Easterly* Wind, but then it blew exceeding hard, and so comes to be accounted for, by what was observ'd upon the Third Remark.

5. In Calm Frosty Weather the *Mercury* generally stands High, because (as I conceive) it seldom freezes but when the Winds come out of the *Northern* and *North-Eastern* Quarters, or at least unless those Winds blow at no great distance off : For the *Northern* Parts of *Germany*, *Denmark*, *Sweden*, *Norway*, and all that Tract from whence *North-Eastern* Winds come, are subject to almost continual Frost all the Winter ; and thereby the Lower Air is very much Condens'd, and in that State is brought *Hitherwards* by those Winds, and being accumulated by the Opposition of the *Westerly* Wind blowing in the *Ocean*, the *Mercury* must needs be press'd to a more than ordinary Height ; and as a concurring Cause, the shrinking of the Lower Parts of the Air into lesser room by Cold, must needs cause a Descent of the Upper Parts of the Atmosphere to re-

T

duce

duce the Cavity made by this Contraction to an *Æquilibrium*.

6. After great Storms of Wind, when the *Mercury* has been very Low, it generally Rises again very fast: I once observ'd it to Rise an Inch and half in less than six Hours after a long continu'd Storm of *South-West* Wind. The Reason is, because the Air being very much rarify'd by the great Evacuations which such continu'd Storms made thereof, the neighbouring Air runs in the more swiftly to bring it to an *Æquilibrium*, as we see Water runs the faster for having a great Declivity.

7. The Variations are greater in the more *Northerly* Places, as at *Stockholm* greater than at *Paris* (compar'd by M. PASCALL), because the more *Northerly* Parts have usually greater Storms of Wind than the more *Southerly*, whereby the *Mercury* shou'd sink Lower in that Extreme; and then the *Northerly* Winds bringing the condens'd and ponderous Air from the Neighbourhood of the *Pole*, and that again being check'd by a *Southerly* Wind, at no great distance, and so heap'd, must of Necessity make the *Mercury*, in such Case, stand Higher in the other Extreme.

8. And

8. And lastly, this Remark, That there is little or no Variation near the *Æquinoctial*, does above all others, confirm the Hypothesis of the Variable Winds being the Cause of these Variations of the Height of the *Mercury*; for in the Places above-mention'd, there is always an easy Gale of Wind blowing nearly from the same Point, *viz.* E. N. E. at *Barbadoes*, and E. S. E. at *St. Helena*; so that there being no contrary Currents of the Air to exhaust or accumulate it, the Atmosphere continues much in the same State: However upon Hurricanes (the most violent of Storms) the *Mercury* has been observ'd very Low, but this but Once in two or three Years, and it soon recovers its settled State of about 29 Inches and a Half.

Dr. WALLIS's Observations on the *Barometer* are these:

In thick foggy Weather I find my *Quick-silver* to Rise; which I ascribe to the Heaviness of the Vapours in the Air.

In Sun-shiny Weather it Rises also (and commonly the Clearer, the more) which I think may be imputed partly to the Vapours rais'd by the SUN, and making the

148 *Signs of the Weather*

Air heavier ; and partly to the Heat, increasing the Elastic or Springy Power of the Air : which latter I rather add, because I have sometimes observ'd in Sun-shiny Weather, when there have come Clouds for some considerable Time (suppose an Hour or two) the *Quick-silver* has fallen ; and then the Sun's breaking out again, it has Risen as before.

In Rainy Weather it uses to fall (of which the Reason is obvious, because the Air is lighten'd by so much as falls) : In Snowy Weather likewise, but not so much as in Rain. And sometimes I have observ'd it upon a Hoary Frost falling in the Night.

In Windy Weather I find it generally to Fall ; and that more universally, and more discernably, than upon Rain (which I attribute to the Wind's moving the Air Collaterally, and thereby not suffering it to press so much directly downwards ; the like of which we see in Swimming, &c.) and I have never found it Lower than in High Winds.

I have divers times, upon discerning my *Quick-silver* to Fall without any visible Cause at Home, look'd Abroad, and found
(by

(by the Appearance of broken Clouds, or otherwise) that it had rain'd not far off, tho' not with Us: whereupon the Air being then Light'ned, our Heavier Air (where it rain'd not) may have in part discharg'd it self on that Lighter.

Dr. LISTER'S Observations on the *Barometer* are these:

In *England*, in a violent Storm, or when the *Quick-silver* is at the very Lowest, it then visibly breaks and emits small Particles (as I have more than once observ'd) which Disorder I look upon as a kind of Fretting; and consequently at all times of its Descent, it is more or less upon the Fret. In this Disorder of the *Quick-silver*, I imagine it has its Parts contracted; because then the *Quick-silver* emits fresh Particles of Air into the Tube, which increasing the Bulk of the Air, and consequently its Elasticity, the *Quick-silver* is necessarily depress'd thereby. And that much Air is mix'd with it, appears from the Application of a heated Iron to the Tube, as is practis'd in the Purging of it that Way.

Now when the *Quick-silver* Rises in the Tube (which it certainly does both in
Hot

Hot and Frosty Weather) it may then be in a Natural State, free, open, and expanded like it self, which it seems it ever is within the *Tropicks*, and with Us only in very Hot and very Frosty Weather. But when it descends, it is then contracted, and as it were convuls'd and drawn together, as it mostly is in our *Climate of England*, and more or less (as we guess) in all Places on this Side the *Tropicks*. Which Contraction plainly appears from the Concave Figure of both Superficies, not only in that of the *Quick-silver* in the Tube, but also (if well observ'd) in that which stagnates in the Pot or Dish it self.

The Difficulty seems to lie in the Reconciling the same Effect of the *Quick-silver's* Rising in the Tube, from such seemingly-different Causes, as great Heat and intense Frost: And those who shall willingly assent to us in one Particular, and grant us Warmth as a probable Cause of its Restitution to its Nature, will yet be at a stand how to imagine, that Great Frost likewise shou'd bring the *Quick-silver* nearer to its own Nature too. I answer, That *Salts* liquify'd will coagulate or crystallize,

stalize, *i. e.* will return to their own proper Natures, both in Cold and in Heat : And therefore tho' most Men practise the Setting them in a Cool Cellar for that Purpose, yet some (as ZWELFER) advise, as the best means to have them speedily and fairly Crystaliz'd, to keep them constantly in *Balneo*. Thus also the *Lympha* of the *Blood* does become a Jelly if you set it in a Cool Place, and the same is by Warmth in like manner inspissated.

It will not be amiss to add by way of Corollary a Note concerning Healthful and Sickly Seasons, more particularly as may refer to this *Phænomenon* of Great Cold and Frost. If therefore *Quick-silver* and *Liquids* are nearest their own Natures, and have less Violence done to them, in very Cold and very Hot Seasons ; the Humours of our Bodies, as *Liquids*, in all Probability must be in some measure accordingly affected. And that therefore Cold is Healthful, I argue from the vast Number of Old Men and Women to be found upon the Mountains of *England*, comparatively to what are found elsewhere.

Again,

Again, the *Blood* itself (or the vital *Liquor* of Animals equivalent to it) is in most kinds of Animals in Nature, or its Natural State, sensibly Cold; for that the Species of Quadrupeds and Fowls are not to be compar'd, for Number, to Fishes and Insects; there being in all Probability (by what I have observ'd) above a hundred Species of these latter Creatures, whose Vital Juice is Cold, to one of the former: But because we most converse with those whose Vital Juice is Hot, we are apt to think the same of all.

Mr. BOYLE has left us these general Observations and Directions concerning the *Barometer*:

1. It will be requisite to note the Day and Hour in which Observations are made.

2. The Situation of the Place where the *Barometer* stands as to Height, since by the Length of the Atmospheric Pillar of Air, that presses upon it, the Height of the *Mercury* may vary, tho' not always exactly; for sometimes upon Changes in the Air not otherwise observable, the *Mercury* will subside more than usually in that which stands farthest from the Centre
of

of the Earth, when at the same time it does not proportionably subside in that which is plac'd in a Lower Station. And

It perhaps may be worth noting, whether upon excessive Droughts, when the Ground is parch'd and crack'd, some Subterranean Effluvia may not rise, which may add a Specific Gravity to the Air.

Nor will it be needless, when other Observations are making, at the same time to observe the Weather; as also what Winds blow, and whether Violent or more Remiss. For sometimes it is observ'd, that when High Winds blow, the *Mercury* is the Lower, tho' not always.

But to favour what has been intimated, *viz.* That the Alterations in the Weight of the Air depend on Subterranean Steams mix'd with it; it has been observ'd that after long Droughts, upon a Shower of Rain, so many Steams have been either prevented from Rising, or depress'd and precipitated, that the *Mercury* has subsided within Two sixteen Parts of an Inch.

The Reverend and Ingenious Dr. DESAGULIERS's Account of *Barometers* is this:

'Tis evident that the *Mercury* within the Tube gravitates as much on the Surface

U

of

154 *Signs of the Weather*

of the stagnant Mercury, as the Air does on the rest of its Surface; and that a Column of Air reaching to the Top of the Atmosphere, is of the same Weight with a Column of *Mercury* of the same Basis, and of an Height equal to the *Mercury* in the Tube. Now if the Air shou'd grow Heavier, and press more on the Surface of the stagnant Mercury, then the *Mercury* in the Tube might rise Higher, that it may be equal in Weight to a Column of Air of the same Basis, reaching to the Top of the Atmosphere.

Hence it follows, that the Height of the *Mercury* in the Tube may be fitly apply'd to measure the Gravity of the Air, and on that account an Instrument fitted to that purpose is call'd *A Barometer*.

Sometimes the *Mercury* Rises 31 Inches, sometimes it stands at 29, but seldom under, and of Consequence the Gravity of the Air must alter proportionably.

Since Gravity is always proportionable to the Quantity of Matter, it is impossible that the Air shou'd change its Gravity, without changing its Quantity of Matter; and therefore some have thought this Difference

ference of the Air's Gravity to proceed from its being more or less overcharg'd with Vapours : If this were the Case, there must be as many Vapours in the Air at a time, as are equal to three Inches of *Mercury*, for so much we find the *Mercury* rises or falls.

Now *Mercury* is about fourteen times Heavier than Water, and consequently there must be in the Air at once as many Vapours as will equal in Length a Column of Water of forty-two Inches High, and whose Basis is equal to the Surface of the Earth; which is more than falls down in Rain during a whole Year ; for a whole Year's Rain does not fill a Vessel above fourteen or fifteen Inches High, as is observ'd in the History of the Royal Academy at *Paris*.

The Reason then why the Air is Heavier at one time than another, arises from there being more Air on that Part of the Earth's Surface where the Air grows Heavier, and this proceeds from Winds ; *e. gr.* If the Wind (which is nothing but a Stream of Air) shou'd blow over any Place, and the Air thus mov'd shou'd be kept in that

156 *Signs of the Weather*

Place by Mountains or Hills ; or if two Contrary Winds shou'd blow on the same Place, the Air wou'd be heap'd up in the Middle, and consequently there being more Air, its Gravity will be encreas'd : But if a Wind shou'd blow over a Country, the Air which is over that Place will be less in Quantity, and consequently Lighter. Hence it is plain, that Winds are the only Cause of the Air's Gravity.

When the Air is Heavy, the Sun acting on the Surface of the Water raises the Vapours from it ; these being rais'd are specifically Lighter than Air, and consequently they must rise Higher, till they come to an Air of the same specifick Gravity with themselves, where they will rest ; and a vast Collection of these Vapours from Clouds, so long as the Air continues Heavy, the Vapours will be sustain'd, and the *Weather* will be Fair. But if the Air turns Lighter, the Vapours which were in *Æquilibrio* with it before, will now preponderate, and consequently descend : In their Descent being continually check'd by the greater Resistance of Air with which they meet, they will be Condens'd ; this Condensation

denfation will ftill grow more and more, till at laft they are form'd into Drops of *Rain*.

Hence it follows, That when the *Mercury* is High, then the *Weather* will be Fair; and when it Falls Low, the Vapours then not being fufficiently fustain'd by the Air, muft alfo Fall, and the *Weather* will be Rainy, and the Rain more or lefs according as the *Mercury* Rifes or Falls in the Tube. Upon this Principle common Weather-Glaffes are made.

I fhall conclude this Chapter with a Word or two about *Hygrometers*. As the *Thermometer* meafures the Degrees of Cold and Heat, and the *Barometer* thofe of the Weight of the Air, fo we may make ufe of a Machine call'd *Hygrometer* or *Hygrofcope* to meafure the Drynefs or Humidity of the Air; for certain it is, that the Air is more or lefs Moift, as it is more or lefs ftock'd with Vapours.

One fort of *Hygrometer* may be made of a String of Cat-gut, five Foot long, made faft at its two Extremities, againft any Wall or Wainfcot, loaded in the middle with a Lead-Weight of nine Ounces
and

158 *Signs of the Weather*

and three Quarters, tied to the String, which will lower it more or less according to the Degrees of the Dryness or Moisture of the Air mark'd upon a perpendicular Plain divided into equal Parts, like the Table belonging to a *Barometer* : for when the String has been steep'd in Brine, the Moistness of the Air will contract it, and so raise the Weight ; and on the contrary, the Dryness of the Air will extend it, and consequently the Weight will sink. You may also contrive an Index to be plac'd against the Degrees of Variation, to slide Higher or Lower, and by it discover how much the *Weather* varies every Day, or is at a Stand. Instead of Cat-string you may have a Piece of Packthread or Whipcord five Foot long, which indeed seems to be more susceptible of Moisture ; for Moisture easily insinuates into all Porous Bodies, and above all, into Strings which shorten sensibly upon the accession of the least Moisture. Thus when SIXTUS V. set up the Obelisk of the *Vatican* in *Rome*, the Cables being made longer by that huge Weight, which (M. OZANAM tells us) weigh'd one Million, six Thousand, forty-eight

from the Weather-glasses. 159

eight Pounds, he order'd the Cables to be soak'd in Water, upon which they shrunk so that they set that huge Mass upon its Basis, as it now stands. Thus M. OZANAM tell us in a few Words; but the true Story is this, and worthy of a Digression. The aforementioned *Obelisk* is still standing in *Rome*, and consists of one solid Stone, a kind of Ophite or spotted Marble, anciently consecrated to the Honour of the the Emperor JULIUS CÆSAR, and erected in the Cirque of NERO; but in the Year 1586, remov'd into a more eminent Place, at the vast Charge of Pope SIXTUS QUINTUS, and by the admirable Skill of DOMINICUS FONTANUS, an excellent Architect and Engineer. This Stone is in Height 170 Foot above the Base, in Breadth at the Bottom 12 Foot, at the Top 8 Foot. It weigh'd 9,586,148 *lb.* And the Weight of the Cables, Cords, and Pullies, and other moveable Instruments used in raising it, amounted to 1,42,824 *lb.* according to the Computation of GEORGIUS DRANDIUS. The Removing and Erection of this *Obelisk*, was thought to be such a rare Work of Art,

Art, that the Engineer, besides the great Mass of Treasure he receiv'd for a Reward from his *Holiness*, thereby acquir'd to himself immortal Renown ; for no less than 56 Learned Men have since professedly written, to describe his Machines then used, and to celebrate his Praises, as MONANTHOLIUS tells us. But notwithstanding all their Praises, he ow'd no small Part of his Honour to Fortune, or rather to the Direction of a Carter, who stood by as an idle Spectator : For the Engineer a little mistaken in his Forecast of the Stretching of the Cables and Ropes, found when he came to set the erected *Obelisk* upon the Pedestal, that he had not rais'd it high enough by two or three Inches, and to raise it Higher with those Machines to stretch, it was impossible. Confounded with Shame and Despair by this unforeseen Failure, he began to think of flying to save his Life, which he had pawn'd to the *Pope* to be forfeited if he did not accomplish this difficult Work he had undertaken : When as Good Luck wou'd have it, out of the Crowd of vulgar Gazers, comes a poor Carter and advises him to
soak

soak all his Cables and Ropes in Water ; which being done, the Ropes quickly swell'd and shortned themselves ; so that they lifted up the *Column* to a due Height, and then the over-joy'd *Engineer* with ease plac'd it upon the Pedestal.

The same is an Observation likewise amongst *Mariners*, that new Cable being soak'd in Water, will shrink so that a large Ship, with the Current of the Sea and Violence of Tempests, is not able to stretch it out again.

'Tis also an Observation amongst *Ringers*, that only the Humidity of the Air in foggy *Weather*, will so contract the *Bell-ropes*, that they will be too short for them, so that they are often forc'd to let them out ; for it is observ'd, that when two or three Men have us'd their whole Strength for some considerable time in raising a *Bell* of 20 or 30,00*lb.* that the *Rope* will be stretch'd out but very little, till the Moisture is again exhal'd out of it.

But to proceed —

Another Way of making a good *Hygroscope* is, by putting a certain Quantity of *Salt-petre* well calcin'd, into one Scale of a just Balance, and an equal Weight of

X

Lead-

Lead-Drops into the other, so as to make the Scales hang exactly in *Æquilibrio* ; then add to the Centre of the Motion of the Balance, a small Circle divided into equal Parts, representing the Degrees of the Dryness or Moisture of the Air, which the Tongue of the Balance will point to, as the Air grows Moist or Drier, for the Moist the Air grows, the more will the Lead rise. Let the *Hygrometer* be fixt up in a Room where no Fire is wont to be made.

But the Invention of *Hygroscopes* is endless : I shall therefore only add this Observation : Mr. FOUCHER, an ingenious *Frenchman* says, he has experienc'd, by means of an *Hygrometer*, that in Summer the *Weather* is Moist between Three and Nine in the Morning : and that the Air is Moist (or fuller of Vapours) at Full Moon, than when the Moon is near the Change.

An Essay towards accounting for a continued Course of Wet Years.

EVERY one knows, that (generally speaking) *Great Rains* are succeeded by Great Droughts, and Great Droughts by

by Great Rains : But a continu'd Course of Wet Years is not so easily accounted for. PLUTARCH in his *Life of MARIUS*, makes this Observation, That Great Battles, generally speaking, are attended with Great Rains. And in this I agree with him : But I do not like the Reason he gives for his Opinion. He makes the Great Effusion of *Blood* in Time of War to be the Cause of these *Great Rains*, by reason of the thick Vapours that they produce. 'Tis enough to make any one's Blood rise, to find that any Man in cool *Blood*, shou'd be so *bloodily* mistaken, as to imagine that *Blood* shou'd be the Cause of *Rain*. For how is it possible there shou'd be sufficient Quantities of *Blood* to create such vast Bodies as Clouds ? When once the greatest Part of the Blood is resolv'd into its first Principles, the Alcalious, Phlegmatic, and Terrene Parts subsiding (which are three Parts in five) there will remain no such Quantities of the Volatile Alcalious, and Sulphureous Parts to be exhal'd so as to form any great matter of *Clouds* for such great Rains. Besides, the whole Mass of *Blood* in a Human Body is reckon'd

at most to be but 24 Pound Weight and perhaps when a Man comes to be kill'd in Battle, either by a Cannon-bullet or Small-shot, his Body does not Bleed out above the odd four Pound Weight. Therefore I can scarce think it possible that the *Blood* of a Million of Men shed in several Battles shou'd be sufficient to furnish out, in Vapours and Exhalations, only one single Cloud of Rain of several Miles Circumference, much less many Clouds, so as to make Long and Continu'd Rains.

Whatever might be the Cause of *Great Rains* in former Ages I shall not pretend to determine, but since the Invention and Firing of so much Gun-powder, in Times of War, (of which we have had the Experience in this last Age more than ever) I cannot but think that the Elements are much alter'd, and that we have had Greater Rains of late Years than ever were known in former Ages; and therefore I cannot but attribute these *Great Rains* to the vast Quantities of Sulphur and Nitre occasion'd by the continual Explosions of such prodigious Quantities of Gun-powder in Time of War. For these great Quantities of
Sulphur

Sulphur and Nitre arising from the Explosion of Gun-powder (besides the ordinary Quantities of Sulphur and Nitre arising from the Exhalations out of the Pores of the Earth, together with the constant Vapours arising from the Seas and Rivers) do naturally produce Great Rains of themselves, or else Thunder and Lightning continually attended with great Rains, and that not only immediately but for several Days and Weeks after. Which plainly shews that there is a natural Disposition in Sulphur and Nitre to produce Rain, and any one knows that Sulphur and Nitre are dissoluble in Water, and when they are embodied in a Watry Cloud ; or however, it is Matter of Fact that Rain is the constant Concomitant of Thunder and Lightning which are caus'd by Sulphur and Nitre. We may call to mind (some of us) the Great Rains that were in the Time of the late *Civil Wars*. We may easily remember the continual Wet Years we had during the late twelve Years Campaign in *Flanders*, besides those occasion'd by Wars likewise in several other Parts of the World at the same time. We may still
more

more easily remember the Wet Summers during the late Wars in *Poland* and *Italy, &c.* when at one single Siege there were at least 5000 Bombs fir'd off, many of them 500 *lb.* Weight, and 10 *lb.* of Powder generally used in firing off each single Bomb. The great Quantities of Powder exploded in the aforesaid Wars must needs surely alter the Elements and be the Occasion of more than Ordinary Rains. For nothing can be the Material Cause of Rain but Sulphur and Nitre, and the more the Clouds are supply'd with this Matter, the more the Earth will be supply'd with it, and consequently by a reciprocal Motion of Ascension and Descension we may (I think) reasonably account for the unusual Temperature of the Air, and the Unseasonableness of the Weather.

We may make the same Observations from the Eruptions of *Volcano's* and *Burning Mountains*, which often send forth such great Quantities of Sulphureous Vapours that they never fail forming of Clouds: A late Instance of which we had given us in a Public News-paper call'd *The Evening Post*, N^o 2855 —

Oct. 10.

O^ct. 10. 1727. About Four in the Afternoon it was observ'd that Mount VESUVIUS (which during two Days had vomited, without Intermission, Torrents of blazing *Bitumen*, both out of its principal Mouth, and out of those which are on one Side) was wholly cover'd over with very dark and thick Clouds, which moving gradually towards the City of *Naples*, furround-ed it with Darkness: At the same time there was some Rain and Thunder, but both inconsiderable. About Ten in the Evening the Claps of Thunder increas'd, the Air was inflam'd and darted Fire, by which the Houses were much damag'd, and several Persons sorely hurt. This was follow'd for the Space of four Hours with such *prodigious Showers of Rain*, that it look'd as if all the Cisterns of Heaven had been open'd to destroy the aforesaid miserable *City* and the neighbouring Villages, &c. whose Inhabitants were thrown into unspeakable Consternation at the Sight of the Danger they were in —

Another Instance we had from another News-paper call'd *The Whitehall Evening Post*, N^o 2263. — Sept. 15. 1732. At
Lisbon

Lisbon in *Portugal*, there was a most dreadful Storm of Rain, Thunder and Lightning, which set Fire to the Great Tower of the Castle there, and blew up the Magazine of Powder, in which there was little less than 120,000 *lb.* Weight besides a great Quantity of Bombs and Grenades all fill'd. The Blast of which Powder was so violent that the whole Castle, with the four Low Towers, were blown up into the Air, and above three Parts of the Town entirely destroy'd, and above 600 Persons buried in the Ruins. After this there was a Succession of *Wet* and Tempestuous Weather for a Month.

This may suffice to shew what a Disposition there is in Sulphur and Nitre to create *Rain*.

The like Observations might be made from large and strange METEORS sometimes seen in the Sky. To instance in one, in the Year 1668. the famous Antiquary Mr. ANT. WOOD says that he and several other Gentlemen were at Sir JOHN AUBREY's House at *Borstaff, Bucks*, May 16, when a *Draco volans*, in Shape like a tall Spire Steeple, was seen about
Ten

Ten o'Clock at Night to fall from the Sky. It made the Place so light for a time that they cou'd see to Read, and when it came to the Lower Region, it vanish'd into Sparkles, making a Report. *Great Rains* (says he) and Inundations follow'd.

I might still add, that this Opinion receives farther Confirmation, every Year, from the *March* Winds that never fail producing *April* Showers. For the Sun's Heat being very powerful about the Time of the Spring Solstice, unlocks the Pores of the Earth that the Winter Cold had shut up, and so lets loose great Quantities of Nitrous and Sulphureous Vapours into the Air, which are the Cause of what we call *March* Winds, and after they are got up into the Superior Regions, are there by the Cold of those Regions naturally condens'd into Showers of *Rain*.

In a Word, How often may we observe, that after a few sultry Days in the Spring or Summer-time, when the Sun has extracted good Quantities of Nitrous and Sulphureous Vapours, they quickly fall down again in Showers of *Rain* : And

Y

that

that Rain-water is impregnated with Sulphur and Nitre, is evident to any one that has not lost his Senses, I mean those of Taste and Smell.

Thus having given my Opinion concerning the Cause of *Great and Continu'd Rains*, I conclude this Topic with this Quare, *viz.* Whether or no (if we shou'd make Observations on former Seasons) one might not date the Unseasonableness of the Seasons of late Years, from the Time of the Invention and Use of *Gun-powder*, 300 Years ago? But this Piece of Work I wou'd willingly leave to the *Philomaths* of this Age.

Another Essay towards accounting for the Cause of an Aurora Borealis, or strange Appearance in the Air, Mar. 6. 1711.

LATE when the Sun roll'd down the Western Way,

His Chariot shining with a fainter Ray,
The Silver Moon appear'd serenely bright,
And o'er the Globe diffus'd a keener Light;
The Planets and illustrious Stars were seen,
In mystic Circles dancing round their Queen:
A strange Appearance fill'd us with Surprise,
The Dread of Hearts, and Wonder of all Eyes!

The

AURORA BOREALIS. 171

*The Skies unclos'd, and with prodigious Light
Encreas'd the Lustre of that Starry Night;
Thro' the wide Hemisphere, with sudden Blaze,
It darted to the South its stranger Rays;
As tho' the Sun (who lately roll'd away)
Return'd afresh, his Glories to display,
And gild our Region with a second Day.
So dreadful lately did the Lights appear,
Which spread o'er all the Northern Hemisphere;
When Sol retiring to his Western Bed,
Shot from his Source of Fire a deeper Red;
One sudden Flash succeeds, as one expires,
And Heav'n shot thick its momentary Fires.*

March 6th 17 $\frac{1}{2}$, in the Evening, was observ'd in the Firmament, in most Parts of *Europe*, a very surprizing *Phenomenon*, call'd by the Naturalists AURORA BOREALIS, which tho' not so rare in more *Northern* Climes, is very seldom seen in our *Southern* Parts, and is generally of less Duration where more frequent, (and yet oftner seen in these *Southern* Parts of late Years than ever). The Occasion of which I suppose to be those vast Quantities of Sulphur and Nitre arising from the continual Explosion of so much Gun-powder (over and above what are exhal'd out of the Earth) in Times of War, which have been more frequent in these Parts of the

World than ever). If it be objected, that I give the same Reason for these Coruscations as for Rain ; I answer, The Case is different ; for Rains are always form'd in the gross Atmosphere, but these Coruscations are made in the Pure *Æther* beyond the Atmosphere, or at least beyond the Verge of the Atmosphere.

In the *North-West* was observ'd a small Cloud (if it might be so call'd), or rather a Gathering in the Sky, having something Particular in its Colour. After some time it began to labour and curl, and made many extraordinary Motions and intervolving Turns within itself. In five or six Minutes after it had work'd in this manner within it self, folding (as it were) and unfolding, it separated it self into long and broad Streams of Light, *Coruscation* or *Fulgor*, issuing out of the aforesaid darkish Cloud or Fund of Vapours (about 25 or 30 Degrees above the Horizon, *North-East* as near as cou'd be guess'd) resembling the Beams of the *Sun* setting in a drizzling Evening, the Streams pointing directly towards the *Zenith*. It was the more astonishing, considering the *Sun* had

AURORA BOREALIS. 173

had been more than an Hour set, and the *Moon's* Rising not being till Morning. Presently after some other Streams or Pyramids of Light issued out of the same Cloud, near to the former, with a very unusual Light, and with Variety of Colours, Black, Blue, Flame-colour, Yellow, &c. and so more and more, till all that Part of the Heavens was over-spread. These *Bright Beams* seem'd to make their way, one after another, Regularly enough into the *West*. When they were all posted in the *West*, of a sudden, after one another, they shot almost directly *East-wards* (and avoided the *South* entirely) and this they did with the utmost Precipitation and Celerity. In the *East* they appear'd Higher-colour'd than they did in the *West*; but retain'd still for a little while the Resemblance rather of *Columns of Light* than of Fire-beams. At last they began to wheel about, and intermingle their Points, and made such violent and quick Vibrations among one another, that it was not possible to find out the Order of their Motions. This Hurly-burly of Confusion was about Seven o'Clock in the Evening,

Evening, and more especially about the *Zenith*, and lasted about an Hour and Half; from the Violence whereof on a sudden burst out a very great *Party-colour'd Flame*, which seem'd to be double and folding in upon it self with great Vehemence and Fury. Thro' all that disturb'd Region of the Air, the *Stars* appear'd clear, as thro' a thin bright Smoak, or as the *Sun* sometimes thro' a thin bright Cloud. The other Part of the Heaven toward the *North-East* and *South-East*, was very clear, the *Stars* bright and twinkling as in a Winter's Cold Night when there is no *Moon*. About Nine o'Clock at Night these *Meteors* in a great measure disappear'd, but not quite: Some faint sort of Contentions and Undulations were still perceiv'd from the *East* to the *North*: And about Ten o'Clock they broke out again with fresh Violence, and darted to the *West* in the same manner as before, and thence to the *East*, and so continu'd till about Half an Hour past Eleven, and then they retir'd from the *East* to the *North* again: About Twelve a bright *Globular Body* appear'd as big as,
and

AURORA BOREALIS. 175

and like the *Sun* at his Rising, but not quite so clear. During this Time, the Light was such that one might plainly see to Read. The Night was calm, not so much as a Breath of Wind was perceiv'd. About Three the next Morning, the *Coruscations* by degrees ceas'd, and the *Great Light* in the *North-East* exactly resembled the *Dawn of Day*, ('tis frequently seen in the Morning in the *Northern Parts of Europe*) and therefore call'd AURORA BOREALIS.

*For then small Sparks appear'd, and scatter'd Light
Broke swiftly forth, and wak'd the sleepy Night :
The Night amaz'd began to haste away,
As if those Fires were Beams of coming Day.*

CREECH's Lucret.

Now the Natural Cause of this *Phenomenon* I take to be a vast Quantity of *Nitrous* Particles exhal'd from the *melted Snow* (an unusual Quantity of which we had in the Winter time) together with an Exhalation of a great Quantity of *Sulphureous* Particles, which had been long lock'd up in the Pores of the Earth, and upon the Melting of the *Snow* rais'd up into the Middle Region of the Air (otherwise
this

this *Phenomenon* cou'd not have been so universally seen, as it was, in all Parts). These *Nitrous* and *Sulphureous* Particles being exhal'd in thin Vapours by the Heat of the *Sun* and other *Stars* into the Middle Region, were by degrees condens'd by circumambient, but thin and transparent, Clouds together with the Coldness of that Region, till at last they became a strong compacted Body, — *Vis unita fortior*. This restless and rebellious Spirit of *Nitre* and *Sulphur* in Conjunction, growing stronger and stronger, and altogether impatient of Restraint, was for a long time struggling for Liberty ; till at length, partly by the kind Influence of the rarifying *Sun*, removing the Frontiers, and so making Way for the pressing ambient Clouds to fall back ; and partly by its own proper Force and Motion, fir'd with a turbulent and restless Spirit, it burst thro' all Obstacles (the finer Part of it taking Fire first) displaying it self in flying Colours, in long *Streams* of *Light*, and here and there astonishing *Coruscations* ; to the no small Amazement of the Lower World, many of whose ignorant Inhabitants stood behold-

beholding the Wond'rous, because Unusual Sight.

'Tis not without good Reason, that Dr. HALLEY assumes the Effluvia of the *Magnetical Matter* for this Purpose, since 'tis evident that our Globe of Earth is no other than One Great *Magnet*, and these *Auroræ Boreales* are seldom seen but in the *Polar Regions* of the World, and that most commonly in the Winter Months.

These *Bruta Fulmina*, this harmless *Thunder* and *Lightning* in the Middle Region of the Air, bears some Resemblance with the Common *Thunder* and *Lightning* in our gross Atmosphere : And no doubt but this Unusual Lightning was attended with some *Noise*, tho' little, and not heard at this Distance, because out of the Verge of our Sphere, and beyond the Convexity of our Atmosphere. (That extraordinary *Meteor* of *March* 19. 1718. was computed by the Learned and Accurate Dr. HALLEY to be sixty-nine Miles above the Surface of the Earth). And no doubt but the Matter of Both these Sorts of *Thunder* and *Lightning*, both in the Lower and Middle Region of the Air were the

Z

same,

same, and even the Manner of their Generation the same, only those in the Upper Region were certainly generated of greater Quantity of Exhalations, and charg'd with greater Quantity of *Nitre* and *Sulphur*, and consequently were rais'd the Higher. They differ only as to the Manner of *Lightning* and Illumination. Those *Lightnings* that happen in the Lower Region, are struck and darted upon the Earth all at once, I mean every single Flash at one Stroke, and so all its Matter is scatter'd and dispers'd and hinder'd from rallying again : But the *Lightnings* in the Upper Region being not darted against any Hard Body, are several times recollected. These have a larger, finer, and more unconfin'd Space of Air for Expansion and Explosion. These are shot, with the utmost celerity, a great many Miles at one Flash (according to the Strength and Quantity of the *Aerial Gunpowder* they are charg'd with) and then the remaining Matter is detain'd, embarrass'd and involv'd within some distant and condensing Cloud for some time, as the whole Matter was at first, till at length they rally and burst out again in the same Manner

AURORA BOREALIS. 179

Manner as before, and perform another Stage, and after that another, and perhaps another, till their Force being almost spent in such long Journeys, their Vibrations grow fainter and fainter, and consequently shorter and shorter, they at last terminate in a General Illumination of rarify'd Air, like the *Dawn of Day*, and so call'd AURORA BOREALIS, as I said before. To this we seem to have the concurring Opinion of the Learned GASSENDUS (in Tom. II. *Physicæ*, p. 109.) — *An, ut Causa utcunque dicatur, prodeunt aliquando è Terrâ Vapores ejusmodi, ut longè ultra Atmosphæræ Convexitatem erumpentes, ad illam usque Coni umbræ Terrenæ Regionem pertingunt, quam refracti Radii Solares sic diluunt, ut si qui Vapores in illam incurrerint, possint, illustrati his Radiis, AURORÆ speciem exhibere?*

The Reason of all the *Flashes of Lightning* darting in the same Tract, is the rarify'd Air caus'd by the first Flash. For a small Quantity of fore-running Particles breaking Prison first, and setting out before-hand, prepar'd the Way for the rest by

clearing the Air, and so caus'd those faint *Coruscations* which preceded those more terrible and astonishing Flashes of Lightning.

If it shou'd be objected against this Opinion of mine, That *Nitre* is a Cold Body, and therefore cou'd not be any Constituent Part of this Hot and *Fiery Meteor* I speak of. Let us suppose the Supposition just, yet *Nitre* and *Sulphur* mixt together, must be allow'd to be Inflammable; and if the Objector had but Courage enough to place himself at the Mouth of a fir'd Cannon charg'd with such Ingredients, he might quickly be convinc'd by Experiment. But not to put him to so much Danger, 'twill be safer for him to apply himself to that Learned Naturalist Mr. BOYLE for Conviction, who in his *Experimental History of Cold*, (*Tit. 17. Sect. 8.*) confutes GASSENDUS, who ascribes the Frigorifick Virtue of Bodies to the Admixture of *Nitre*. Tho' I allow *Nitre* (says he) to be a Substance dispers'd thro' most Bodies, yet, since *Cold* is only a Privative Quality and an Absence of Heat, there are other Agents, which by stopping the Motion of
the

AURORA BOREALIS. 181

the insensible Parts of a Body, may deprive it of its Property of Heating. And tho' GASSENDUS asserts, that Bodies receive the Impressions of *Cold* from *Nitrous* Exhalations swimming in the Air; yet amongst all the Experiments I have made to resolve *Nitre* into Vapours, I have not found that it was able to effect more in the Production of *Cold*, than any other Saline Bodies. And Spirit of *Nitre* is so far from having an actual *Coldness* greater than any other Bodies, that it is potentially *Hot*. And whether the Exhalations of *Nitre* will congeal Water or not, *Spirit of Nitre*, I have observ'd, will dissolve Ice, as soon almost as *Spirit of Wine*: And tho' *Nitre* mixt with Snow or Ice may promote Congelation, yet it proves not that the Parts of *Nitre* are *frigorifick*; since the Experiment will succeed with *Spirit of Wine*—Thus far that Excellent *Naturalist*.

Let us now compare what has been said upon our *Phænomenon* which appear'd lately, with a like *Phænomenon* that appear'd about a hundred Years ago, and is describ'd by the afore-mention'd Learned GASSENDUS, in his Chapter *De AURORA BOREALI*,

BOREALI, & Ignibus noctu per Aerem
discurrere visis. Tom.ii. *Physica*, p.107. &c.

Circa *Fulgorem* mirabilem, qui aliquando Nocte intempestivâ & silente *Lunâ*, totum *Septentrionalem* Tractum ita occupat, ut claram *AURORAM* mentiatur, unde & *AURORA BOREALIS* ab aliquibus dicitur. Quædam *Phænomenorum* (inquit *SENECA*) tantum *Lucis* emittunt, ut fugent *Tenebras*, & *Diem* representent, donec consumpto *Alimento*, primùm *Obscuriora* sint, deindè *Flammæ* modo, quæ in se cadit, per assiduam diminutionem redigantur in nihilum. Tale *Phænomenon* apparuit Anno 1621. *Sept.* 12.

Sunt quatuor modi horum *Phænomenorum* generandorum, qui ab *EPICURO* recensentur. Unus non prorsùs improbabilis esse videtur, ut habens quidpiam simile cum *Fulminum* Generatione. Scilicet ejusdem generis *Materies* sic ascendere sursùm debet, ut non grandi quidem & condensâ *Nube*, sed tenui tamen nec serenitatem conturbante *Nebulâ* (nempe tales aliquæ sunt ex quibus sæpè vidimus concreescere spontè in sereno *Nubes*) ut, inquam, tenui *Nebulâ* (quasi amictu quodam) contineri debeat, quousque *Sublimè* evecta, intra eam volvatur, incalescat, ex quâ parte tenuior, amiculumque fragilior fuerit, accendatur, erumpat, ac interim *Ignis* reliquam *Materiam*, ob sui lentorem, seu tenacitatem non statim depastam, in residuam partem amiculi urgeat, avolantemque, ut continens sui pabulum insectaretur, quousque eâ planè consumptâ, ipse extabescat, & visibilis fieri desinat.

Albor ille, five *AURORÆ* speciem æmulata *Claritas*, apparuit mihi ad *Boream*; sic ad *Boream* quoque apparuerit quibuscunque conspicua fuit, nemini verò prorsùs

AURORA BOREALIS. 183

prorsus ad *Austrum*. Stuporem adauget, vel ex eo quodd cum Materies *Phænomeni* fuisse pertenuis Vapor videretur, oportuerit talem Vaporem esse aut immensæ Diffusionis Secundum Terræ Superficiem, aut immensæ Altitudinis, ut nihil Superficie Terræ Devexitas obstiterit, quò minùs è Locis adeò diffitis eodem in situ conspiceretur: ac tantò magis, si ulterius & in extremum usque *Septentrionalem* fuit *Phænomenon* propagatum.

i. e.

Concerning those wonderful Flashes of Lightning, that sometimes in a quiet and dark Night so enlighten all the Northern Part of the Sky that it resembles a clear Morning, and is therefore call'd by some AURORA BOREALIS, or the NORTHERN MORNING. There are some Phænomena or Meteors (says SENECA) that send out so much Light, that they dispel the Darkness of the Night and represent the Day, till after their Aliment was spent, their Light began to grow dimmer, and at last like a Flame by continual Diminution was wholly extinguish'd. Such was the Phænomenon that was seen Sept. 12. 1621.

EPICURUS reckons up four Ways whereby these Phænomena come to be generated. One of which is not altogether improbable, as being something like the Generation of Common Thunder and Lightning. For the Matter of this Sort of Meteors shou'd ascend Upwards so as not to be involv'd in any great or thick Cloud, but only a thin and transparent one (like those we often see form greater Clouds in a clear Sky), I say, the Matter shou'd be contain'd in some little thin Cloud, till being rais'd up High it be involv'd in it, and grows Hot, and takes Fire at the thinner and weaker Part of the Cloud,

Cloud, bursts out, and in the mean time this Combustion forces the rest of the Matter (that is not presently consum'd by reason of its Viscosity) into the other Part of the Cloud, and follows it flying off as containing its Aliment, until such time as that Matter is quite consum'd, and it self is extinguish'd and becomes invisible.

That Light or Coruscation that resembled the Morning (says GASSENDUS) appear'd to me in the North; and so it did to every body that saw it; but no body ever saw it in the South Quarter. 'Twas the more surprising upon this account, because since the Matter of this Phænomenon seem'd to be but a very Thin Vapour, it was necessary that That Vapour shou'd be either of a vast Extent to answer the Superficies of the Earth; or else of a vast Height, that the Devexity of the Superficies of the Earth shou'd not hinder its being seen in the same Situation from Places so far distant: and so much the more, if this Phænomenon had spread farther even to the utmost Parts of the Northern Quarter.

It may not be improper in this Place to add to this (by way of further Explanation of these Matters) the Accounts that are given of *Igneous Meteors* by the Learned Dr. WALLIS, Dr. WOODWARD, Dr. ROBINSON, Dr. PLOT, and Mr. MORTON.

Dr. ROBINSON (in LOWTH. Abridg. of the *Philos. Trans.* Vol. V. p. 128.) says he is of Opinion, that those *Phosphorous or Luminous Appearances* in the Firmament proceed

proceed from the various Effluvia perspir'd out of our Globe, or passing thro' it; for I have seen those Lights over *Vesuvius*, the *Strombulo* Islands, and towards *Ætna*, in dark Nights, when those Volcano's were not flaming nor burning, their Sides and Tops being passable to Travellers at that Time, and all their Outward Parts quiet. We are certain that *Iceland* and *Greenland* abound with Vulcano's; so may North-East *Lapland*, North *Russia* and *Tartary*, where vast Chains of Mountains are said to run. The *Jesuits* and other Travellers relate many prodigious Eruptions of *Fires* and *Earthquakes* towards the North of *China*; but nearer the *Pole* the Earth must be clos'd and pent up many Months, by the long severe Freezings and continual Snow and Ice, which relaxing towards Spring, may give Vent to that vast Mass or Magazine of perspirable Matter, that had been kept so long in Hot Subterraneous Prisons. This may be one Reason why Animal Bodies themselves are often sensible of Changes at that Season in our Climate, when Perspiration is upon such an Increase.

Mr. MORTON's Opinion of *Igneous Meteors*, is (as he tells us in his *Nat. Hist. of Northamptonsh.* p. 343.) That they are form'd of Mineral Exhalations, as Thunder and Lightning. The Cause whereof is especially *Nitre and Sulphur*, rais'd out of the Earth by a considerable Degree of Heat, and thence born up by the like Degree of Heat into the Atmosphere, where they constitute a kind of *Aerial Gunpowder*. And what Dr. WOODWARD (in his *Nat. Hist. of the Earth*, p. 205, 206.) speaks with so much Clearness concerning the *Fulminating Damps*, is fitly applicable to this Sort of *Meteor*; the Matter of both being the same; and that differing from this in this respect only, or chiefly, that the Matter of the *Fulminating Damp* is sustain'd in the Air of the Mine or Coal-pit by a Lesser Degree of Heat, this of *Lightning* is taken up into the Atmosphere by a Greater Degree of Heat. And give me leave to add, that the Matter of the AURORA BOREALIS was exhal'd into the Middle Region by a still Greater Degree of Heat, otherwise it cou'd not have made its Way thro' the Atmosphere, and
so

AURORA BOREALIS. 187

so got into a Higher Region, above forty Miles distant from our Earth.

This *Mineral Matter* which arises in Separate Parcels from the Earth, and in a considerable Quantity assembling more Closely in the Atmosphere, becomes, upon being enkindl'd by the Heat that then accompanies it, a quick, active, and forcible Fire, which striking thro' the ambient Air, or thro' the Cloud that encompass'd it, with great Celerity, is what we call *Lightning*, as the Cloud and great Noise that usually attends it, has the Name of *Thunder*: Whereof the Cause is the Discharge or Explosion of this Fire from a Cloud; which as it is more or less Compact, and the Fire breaking forth of it more or less Forcible, the Noise is accordingly greater or less. When a great Quantity of this inflammable Matter is assembl'd, and takes Fire at once, it occasions a Noise like that of several Great Guns discharg'd at one and the same Time. When it lies in a thinner and more dispers'd Collection, or in separate Parcels, and is by little and little, or successively attended, it occasions a Noise resembling that of Peals or Vollics

which are made by a *Running Fire* (as they term it) of several smaller Guns discharg'd in a Train one after another. When the Cloud is of such large Extent, and withal so compact that the Fire, tho' strong, is unable to break thro' it, it occasions a deep and rolling Noise, not attended with *Lightning*, the Fire being spent by Degrees in the Bosom of the Cloud.

There are other more harmless METEORS of the *Fiery* Kind (says Mr. MORTON, p. 348.) which are not to be pass'd by without some Remarks. *Sept. 20. 1676.* about Seven at Night, was seen an unusual *Meteor*, by some call'd *Draco volans*, in *Northamptonshire*, and the Neighbouring Counties ; whereof we have a short Account from Dr. WALLIS (in the *Philos. Transf.* N^o 135. p. 863.) About Seven at Night (says he) appear'd a sudden *Light*, equal to that of *Noon-day*, so that the smallest Pin or Straw might be seen lying on the Ground. And Above in the Air was seen (at no great Distance, as was suppos'd) a Long Appearance as of Fire, like a Long Arm (for so it was describ'd to me) with a great Knob at the End of it ; shooting
ing

ing along very swiftly : And at its Disappearing seem'd to break into small Sparks, or Parcels of Fire, like as Rockets and such Artificial Fire-works in the Air are wont to do. 'Twas so surprizing, and of so short Continuance, that it was scarce Half a Minute. This Fiery Meteor might be a *Draco volans*, or some *small Comet*, because it was seen in most Places in *England*. Dr. PLOT (in his *Nat. Hist. of Staffordsh.* p. 20.) calls this Meteor *Capra Saltans*, which (as it was describ'd to him) appear'd like a Great Fire at a distance, but coming nearer, its Form and Motion were plainer, it being of a Globular Figure, moving by Jerks, and making short Rests, at every one of them letting fall Drops of Fire, which were Part of its Body, for it decreas'd in Magnitude the farther it went, and the oftner it drop'd ; so that it wholly disappear'd at about three Quarters of a Mile distance.

The said Mr. MORTON proceeds to give us an Account of some more *Meteors*, one that was observ'd in *Sept.* 1693. the Top of which was in the Form of the Letter W, and had a Lift or String of Light appendant

dant to the lower Part of the W, about a Yard and Half in Length. It continu'd some Time, and was seen by several round the Country.

In *Aug.* 1699. was observ'd a *Globe of Fire*, of surprizing Brightness and Magnitude, in the *Western* Part of the Hemisphere, a little after Sun-setting. It struck downwards in an Oblique Line, and disappear'd when it came almost as low as the Horizon. In or near the Place of it, there succeeded a narrow Lift or Stream (as it were) of a *Fiery Smoak*, about 35 Degrees in Length, which continu'd compact and unbroken for the Space of almost two Hours. Towards the Close of it, it became somewhat Winding or Curled. At length it was broken or dispers'd by Clouds that pass'd that Way.

Somewhat more observable are those seeming Burnings of the Air, or *very bright Illuminations* which the two following Relations inform us of. At *Higham-Ferrers* in *Northamptonshire*, *Jan.* 28. 1699. about Half an Hour past Five in the Morning appear'd on a sudden a more than ordinary Light, like a Flash of Lightning,
but

but of longer Continuance, much outshining the Light of the *Moon*, which till then was clear. It continu'd over *Higham* about the Space of a Minute, and seem'd to move from *East to West*. And about Five o' Clock that very Morning was seen at *Plymouth* a prodigious Light in the Firmament, of which perhaps this in *Northamptonshire* was a Part.

The other Relation is as follows: *Dec.* 18. 1707. About Eight o' Clock at Night, the Wind being *Westward* (a brisk Gale) and the Sky serene and clear, there appear'd at *Fenshed* in *Northamptonshire*, a *Brightness in the Air*, which made an Arch from *North-West* to *North-East*, equal to that which the *Sun* makes at the Winter-Solstice, extending it self from nigh the Bottom of our Hemisphere to nigh the two Pointers of *Ursa major*. The Light was pale and of a Silver Colour, so light that all the *Stars* within the Compass of it, unless one or two of the first Magnitude, were not to be perceiv'd, being obscur'd by the Greater Light, which, as far as it extended, was equal to that of the Day. There was a dark Cloud which lay (as it seem'd

seem'd to us) along the Horizon, from one End of the Brightness almost to the other, and about Half a Degree Diameter. There was another long dark Cloud, of a Cylindrical Figure, which lay Horizontally, and seem'd to divide the Brightness into two almost equal Parts. It had little or no Motion, tho' the Wind blow'd briskly. But on a sudden there appear'd a swelling Brightness in that Cylindric Cloud, which broke out into Flames of a Pale-colour'd Fire, that spread themselves very far *Southwards*, and very nigh the Bottom of the *Northern* Part of our Hemisphere. The Flames lasted not longer than Half a Minute, and then were carried *Eastward* and soon vanish'd. It was wonderfully frightful and amazing. The Brightness also was very strange, and continu'd till Eleven o' Clock.

Somewhat parallel hereto, Mr. Stow (the old Judicious Chronicler) relates from his Own Observations. About Mid-night, *Novem. 14. 1574.* *Fire* and *Smoak* were seen to proceed from a Black Cloud in the *North*. The following Night the Heavens seem'd to be all on Fire; and over our
Heads

Heads (says he) the Flames from the Horizon did meet, and there roll one in another as in a Furnace, in a marvellous raging manner.

There is (says Mr. MORTON) no room to suspect the Credibility of the two former Relations, that from *Higham*, and that from *Finsbed*. All that I wou'd enquire is, Whether these *Extraordinary Splendors* in the Air do not usually happen at or nigh the Time of *Tempestuous Winds*; the Agent that produces them perhaps bearing forth from the Earth a considerable Quantity of subtiler and purer Igneous Matter, as the Heat which is discharg'd out of the Earth at the Time of Earthquakes, educes and bears up along with it such a Quantity of several Kinds of Mineral Matter, as to thicken, discover, and darken the Atmosphere. (*Vid. Dr. WOODWARD's Nat. Hist. of the Earth*, p. 202.) That these *Unwonted Illuminations* appertain to the *Igneous Tribe of Meteors*, appears by several Circumstances, and particularly by that of the Eruption of Flames from out of the Black Clouds. And to me they seem constituted of a thin and

B b dispers'd

dispers'd Collection of the Parts of Fire, of Quantity and Strength sufficient to enlighten the Air, especially if serene and clear ; tho' not to heat it so that the Senses can discover any more than Ordinary Warmth in it, tho' perhaps a *Thermometer* might.

Besides the AURORA BOREALIS that I have been hitherto describing, we have had several others, the most remarkable of which were those on *Oct. 8. 1726.* also the 3d of *March* following, and on *Nov. 22. 1728.*

Notwithstanding the frequency of these strange *Appearances* in the Air, especially in the *Northern* Climes, and in these *Southern* Parts of late, yet a certain *Author* publish'd a Pamphlet, entituled,

An Essay concerning the Apparition in the Heavens, on the 7th of March, 17 $\frac{1}{2}$. Proving by Mathematical, Logical, and Moral Arguments, that it cou'd not have been produc'd meerly by the Ordinary Course of Nature, but must of necessity be a Prodigy.

Now, tho' I wou'd by no means derogate from the Extraordinary Providence of
GOD,

GOD, when Things cannot be solv'd by the Ordinary Course of Nature ; yet I see no Reason why we shou'd presently run to Miracles in explaining Natural Events. For this (as a late Learned Author says) breaks the Chains of Natural Providence, when it is done without Necessity, that is, when Things are otherwise Intelligible from second Causes. This is robbing *Peter* to pay *Paul*, and taking so much from GOD's Ordinary Providence, to place it to His Extraordinary. Indeed when a New Religion is brought into the World, 'tis very reasonable it shou'd be usher'd in with Miracles ; but afterwards Things return into their old Channel, and do not change or overflow again, but upon Extraordinary Occasions or Revolutions. The Extraordinary Power of GOD is to be accounted very Sacred, and not to be touch'd or expos'd for Our Pleasure or Conveniency : But I am afraid we often make use of it only to conceal our Own Ignorance, or to save us the Trouble of Enquiring into Natural Causes. We ought to consider that the Course of Nature is truly the Will of GOD, and (as I may so say) his First Will ;

from which we are not to recede, but upon clear Evidence and Necessity. And as in Matter of Religion, we are to follow the Known Reveal'd Will of GOD, and not to trust to every Impulse or Motion of Enthusiasm, as coming from the *Divine Spirit*, unless there be evident Marks that it is Supernatural and cannot come from our Own; so neither are we, without Necessity, to quit the Known and Ordinary Will and Power of GOD establish'd in the Course of Nature, and fly to Supernatural Causes, or his Extraordinary Will; for this is a kind of Enthusiasm, as well as the Other: And no doubt that great Prodigality and Waste of Miracles which some make, is no way to the Honour of GOD and Religion. 'Tis true, the other Extreme is worse than this, for to deny all Miracles, is in Effect to deny all Reveal'd Religion; therefore due Measures are to be taken betwixt these two, so as neither to make the *Divine Power* too mean and cheap, nor the *Power of Nature* Unlimited and All-sufficient.

Nor is this Opinion of making a Prodigy of a meer Natural *Phenomenon*, culpable
only

only upon a *Religious*, but also upon a *Civil* Account. For if it be reckon'd a Prodigy and some Wonderful Thing, predicting some Ill Accident to the Nation in which we live, it may be of very Bad Consequence. Tho' why it shou'd not be reckon'd a Good Omen, as well as a Bad One, or why it shou'd not be Ominous to any other Nation as well as Ours (supposing it observ'd in Other Nations as well as This) I cannot imagine. I say, supposing it reckon'd a Bad-Omen to This Nation (most People being apt to fear the Worst) how must we suppose Peoples Minds prepossess'd with such an Opinion? How wou'd they be (as it were) Planet-struck with a Panick Fear? How fatally Astonish'd and Dishearten'd? Inasmuch that shou'd we suppose a Foreign Prince or Potentate to re-invade us, How flush'd (hereupon) with Hopes of Success might the Invader be? And how dismay'd, and already Half-overcome with Fear, the Invaded? And so this Suppos'd-Ominous *Phænomenon* be as Bad, as MERLIN'S Prophecy heretofore was of Good Consequence to this Kingdom. For we are inform'd

form'd by Mr. CAMDEN, that this Old British Prophet prophesied, That when a Stout *Prince* with a freckled Face, shou'd pass over the Ford call'd *Ryd-pen-carn*, being in a River call'd *Nant-pen-carn*, the *Welsh* shou'd be subdu'd. Which accordingly came to pass; for King HENRY II. who pass'd over this Ford, was Freckle-fac'd; and as soon as the *Welsh* heard where the King came over, their Hearts fail'd them, because of this Prophecy; and so they submitted thro' too much Credulity. It is not impossible, that King HENRY might choose to go over at this Ford in Strength of this Prophecy, and his Enemies Credulity, the more to facilitate his Conquests. *Vide WHISTON's Account of this Meteor, p. 74.*

And as the making these *Phænomena* and unusual Appearances in the Air, to be (I know not what) Miracles and Prodigies, is very *impolitick*, because oftentimes of dangerous Consequence to the State; so likewise the imagining strange Appearances of Military Skirmishes in the Air, or Armies of Aerial Warriors disputing in Battle-Array for Victory, is very *Foolish* as well

as

as *Fanciful*, tho' so seriously mention'd by some of our Old Historians, and too credulously believ'd by the Vulgar. All those fancied Figures of Armies fighting in the Air, and such-like strange Prodigies, being nothing else in reality, but so many small Clouds of odd, and sometimes indeed of strange Shapes, together with Balls and Darts of Fire, or fiery Streaks and Waves, Lightnings and Coruscations, terrible enough to the ignorant Spectators. This is the Whole of the Matter, and all the rest nothing else but Creatures of their own Brain, and the Product of their own Superstitious Imaginations.

But not to insist upon Generals ; let us come to Particulars. The Author of the aforesaid *Pamphlet* endeavours to prove that late *Phænomenon* in the Heavens to have been a *Prodigy*, by Logical, Moral, and Mathematical Arguments. The bare mention of his Logical and Moral Arguments may be sufficient.

His Logical Argument, pag. 16. runs thus ;

All those Things ought in Reason to be accounted Prodigies, to which we can define

fine

fine nothing to be superadded, in order to their being distinguish'd for Prodigies, and which we can only explain to be possibly Natural ; without any other Foundation of a Proof than meer Guess and Divination.

Therefore it ought in Reason to be accounted a Prodigy.

His Moral Argument thus ;

'Tis agreed on all Hands by the Moralists, that the most Probable Opinion is to be follow'd.

Now the most Probable Opinion for Ignorant People to follow is, that This must have been a Prodigy.

Consequently the Opinion that ought to be entertain'd among the Generality of Mankind, is, that it was a Prodigy.

So much, and I think enough, concerning this *Author's* Logical and Moral Arguments. What I am chiefly concern'd to take notice of, is, the *Minor* of his *Mathematical* Argument, though I see no Reason why it might not have been properly call'd *Physical* Argument, which runs thus ;

“ That

“ That this *Fiery Apparition* did not
 “ act according to the Laws of Nature, is
 “ proved by Fact and Experience of all
 “ that saw it ; for after it had Blaz’d, the
 “ Fire went entirely out, and then lighted
 “ again, which is contrary to the Laws of
 “ Nature and Reason ; for when it was
 “ lighted, either there was more Aliment
 “ capable of maintaining so bright a Flame,
 “ or there was not : If there was, how
 “ cou’d the Fire Naturally be extinguish’d
 “ as to appear so ? If there was not, how
 “ cou’d it Naturally light again into as
 “ bright a Flame as ever, so many Hours
 “ afterwards ? ”

Now this *Minor* I beg leave to deny,
 by asserting that our *Phænomenon* or Fiery
 Apparition, did act according to the Laws
 of Nature ; and that it did so, is prov’d
 by Fact and Experience of all that saw it ;
 for after it had blaz’d, the Fire went not
 entirely out : Which I thus prove.

If the *Fire* after it had Blaz’d, went out,
 and was indeed totally extinguish’d, there
 must needs have been observ’d something
 like an Extinction, something of a *Caput*
mortuum or Smoak, or as when such-like

Meteors burst into small Sparks or Parcels of Fire, like Sky-rockets, and such-like Artificial Fire-works in the Air ; or like the *Draco volans* (describ'd by Mr. MORTON, p. 348, of his *Nat. Hist. of Northamptonsh.*) which mov'd by Jerks and made short Rests, letting fall Drops of Fire, which were Parts of its Body, as he tells us. This Supposition, any Man that is any thing of a Meteorologist and in his Right Senses must surely grant.

But nothing of all these (which are the necessary Concomitants of such extinguish'd Meteors) was observ'd in our *Fiery Apparition* (or Apparitions) : But after it had went its Length, *i. e.* after its Elasticity was spent, and a great deal of its Spirit and Vigour unavoidably diminish'd (as plainly appear'd by its next shorter Stages or Flights) as it at first burst out of one Cloud, so afterwards it was shot into, and embarrass'd by another, and again by another, and so on.

Therefore I conclude, that the Fire of this *Apparition*, after it had Blaz'd, did not entirely go out, and was not totally Extinguish'd, and consequently that this
our

our *Phænomenon* or Fiery Apparition did act according to the Laws of Nature, as is prov'd by Fact and Experience of all that saw it, and consequently still, that the said *Phænomenon* in the Heavens, might have been produc'd meerly by the Ordinary Course of Nature, and need not rashly be deem'd a *Prodigy*.

But after all, notwithstanding this Great *Phænomenon* does seem to be nothing else but the Product of meer *Natural* Causes, yet still, in Contemplating these and such-like Wonderful Works of *Nature*, we are Naturally led from hence to celebrate and admire the *Great Author and First Cause of Nature*. For Matter, whether we allow it Motion or not, cou'd not come into that Variety of Tempers and Compositions, in which we find it in the World, without the Influence and Direction of a Superior External Cause, which we call *The Author of Nature*. Thunder and Lightning are things (tho' easily accounted for by Natural Causes) that have terrify'd and affrighted the Greatest Monarchs, and even the most Cruel Tyrants, witness *Tiberius* and other *Roman* Emperors. To-

204 *The Cause of the Plague.*

tal Eclipses likewise of the *Sun* and *Moon* (tho' their Causes are so very well known, and their Times and Periods stated and fix'd) never fail to excite our Admiration and Praises of the Infinite CREATOR and Contriver of them. How much more may such *Uncommon Appearances* force from us such-like Pious Exclamations — O LORD GOD, *Thou art become Exceeding Glorious ! Thou art cloath'd with Majesty and Honour ! Thou deckest thyself with Light, as it were with a Garment, and spreadest out the Heavens like a Curtain ; who makes the Clouds his Chariot, and walks upon the Wings of the Wind ! O LORD, how manifold are Thy Works ! In Wisdom hast Thou made them all ; the Earth is full of thy Riches !* Psal. civ.

The Cause of the Plague.

MR. Professor BRADLEY (in his Book of *Planting and Gardening*) mentions a Letter wrote to him by an Ingenious Hand, Mr. BALLE, concerning the Origin of the *Plague*, which he supposes to be *Insects*

The Cause of the Plague. 205

sects of that extraordinary Smallness, that they are not to be discerned by the naked Eyes ; they are so light that they float in the Air, and are so suck'd in with the Breath. Such *Insects* not being among us commonly, but only when they are either brought to us from some remote Place by the *Wind*, or hatch'd, or nourish'd by Intemperance of *Air*, or some Poisonous *Vapours* arising from Bogs, Ponds, Ditches, or some such unwholesome Funds of Stagnating Water.

These *Insects* are various, according to the Nature of the *Water* or *Air* they are bred in ; their Eggs being first laid by some flying Animals, which are then hatch'd, and passing through the several Changes common to *Insects*, at length take Wing ; and being drawn in with the Breath, may perhaps be either kill'd in our Bodies, and cause a violent Ferment in the Juices ; or else finding proper Nourishment, they breed in the Lungs, Stomach, or other Parts within us, and probably may occasion those Biles and Breakings out in the tender Parts of the Body, that are call'd *Plague Sores*.

But

206 *The Cause of the Plague.*

But these *Insects* are some of them so extremely small, that they are only capable of being discern'd with good Microscopes ; and when they are Wing'd and so quite perfected, may perhaps in Swarms be carried from one Country to another by the *Wind*. It is *Insects* of several Kinds and Colours, which cause the Surface of Waters to appear sometimes *Green*, *Red*, and *Black* ; which last Colour in Water, is observ'd by the Herdsmen to poison the *Cattle* that drink of it ; and they say causes the *Murrain*, which is the *Plague* in Cattle, and is very infectious.

It has been observ'd, that *Plagues* and the most Contagious Distempers, have commonly happen'd in those Years, when the *Easterly Winds* have more than ordinary prevail'd in the *Spring* and *Summer* Seasons ; then the Air comes to be infected, and rarely or never at other times. These *Winds* we see bring Caterpillars, and many different *Insects* and Flies, which meeting with Places fitly adapted to nourish them, they are there brought to their Winged State, which I conceive is the same in the invisible Animals as in the visible ;

The Cause of the Plague. 207

visible ; nor indeed is any Part of the Earth or Waters, and it may be the pure *Air* itself, free from the Seeds of Life : Nothing is out of Motion, or can be void of it, setting forth the Glory and infinite Power and Wisdom of the CREATOR, from whence these infinite Productions proceed ; some for one Use, some for another. What we call the Bad, are those, which at Unseasonable Times invade by Swarms the Bodies of Living Creatures, to whom they are destructive ; and causes the *Murrain*, *Rot*, and such-like mortal *Diseases*.

Again, that the *Plague* proceeds from living Creatures brought by the *Easterly-Winds*, seems probable ; for that such *Pestilences* are most malignant in the Summer, after the *East-Winds* of the *Spring* have blown, which passing over the Greatest Continent of the Earth, bring these *Insects* with it ; but the contrary Effect has the *West-Winds*, which come to us over the Vast *Atlantic* Ocean, attended with great *Rains*. These last *Winds* cure the *Plague* (it may be) by carrying the Remainder of those *Pestiferous Insects* which yet survive, to the Country from whence they

208 *The Cause of the Plague.*

they came : And Frost and Snow likewise stops the *Infection*, perhaps by killing them, or laying them to sleep till the next Season, when they may be either brought back again by the *Easterly-Winds*, or be enliven'd, or fresh Swarms hatch'd by the Temperature of *Air* suitable to them.

I have not yet found that any Winds, except the *East* Winds, such as pass over *Tartary*, bring any Infection with them ; nor have I ever heard of *Pestilential Distempers*, in any Part of the World, unless in such Places only where the *Tartarian* Winds reach ; *Tartary* being a Country full of Woods, Bogs, and Fens, it seems the most capable of producing these Creatures in abundance, which may be carry'd by the *Wind* to certain Places in Search after their Food, as are Locusts, and some certain Birds, which are known to pass from one Country to another.

DIODORUS SICULUS, (in his *Historical Library*, Book xii. p. 286.) says, The *Plague* broke out afresh at *Athens*, when they had been but lately freed from that *Contagion* : It rag'd with that Violence, that they lost 4000 Foot Soldiers,
and

The Cause of the Plague. 209

and 400 Horſe; and of others, Freemen and Servants, above 10,000. And now becauſe the Courſe of the Hiſtory may require a Declaration of the Cauſes of this violent *Diſtemper*, it is neceſſary in this Place to ſet them forth.

Abundance of Rain had fallen in the *Winter*, by reaſon whereof the Earth being over-wet (eſpecially in Low and Hollow Grounds) the Water lay in the ſtanding Pools, which corrupting and putrifying by the Heat of the *Summer*, thence proceeded a Miſt of groſs ſtinking *Vapour*, which corrupted the *Air*; and beſides the want of good Food, much advanc'd the Progreſs of the Diſeaſe; for the Year before, the Fruits by too much *Rain* were crude and unwholeſome.

There was likewise a third Cauſe of this *Diſtemper*, which was this, the *Eteſian Winds* (which I take to be the *Magiſtrali*, or North-Weſt Winds) blew not this Summer, by whoſe gentle Breezes, the violent Heat of the *Air* was us'd to be allay'd at other Times; ſo that the Heat being now more exceſſive, and the *Air* (as it were) inflam'd, Mens Bodies wanting the uſual

D d

Refresh-

210 *The Cause of the Plague.*

Refreshment, contracted an evil Habit, from whence arose *Burning Distempers*; and thence it was that many, seiz'd with this Disease, cast themselves into Pits and Wells.

When the Plague rag'd in *London* in 1666, the Summer was so dry that hardly any *Rains* fell till *November*, which Drought must be occasion'd by an unusual Frequency of *Easterly Winds*.

Experience shews us how much *Insects* delight in Stinking Places, and that they increase much faster in uncleanly Cities, such as *London* was formerly, than in cleaner Places: But the City of *London* having been for the most part burnt the Year after the *Pestilence*, its Streets were enlarg'd, many Drains were made, and good Laws were put in Execution for keeping the City clean, and it has not had any *Plague* ever since.

It is remarkable, that when the *Plague* reign'd in *London*, *Buckler's-Bury*, which stood in the very Heart of the City, was free from that *Distemper*: The Reason given for it is, that it was chiefly inhabited by Druggists and Apothecaries, the Scent
of

The Cause of the Plague. 211

of whose Drugs kept away the *Infection*; which, according to my Notion, were so unnatural to the *Pestilential Insects*, that they were kill'd or driven away by the strong Smell of some Sort of Drugs. The Smell of *Rue*, and the Smoak of *Tobacco*, were prescrib'd as Remedies against the *Infection*, but especially *Tar* and Pitch-Barrels. Likewise the People of *Lime-House* were nor affected by it, nor some of the *Docks*, perhaps for the same Reason. So also the Use of *Sea-coal* may now be one Means to prevent the *Plague* in *London*.

The People of *Leghorn* in *Italy* observe, that at the End of every eighteen Years, they are subject to an *Epidemical Distemper*, which if it be not the *Plague*, is hardly to be distinguish'd from it. I was there in the Year 1685, when it began about the Beginning of *Summer* with frequent *Easterly Winds* (such as are not usual) continuing to blow almost without Intermission till towards *Winter*; much as DIODORUS SICULUS describes the Year to have been when the great *Plague* was at *Athens*; we wanted that *Summer*

212 *The Cause of the Plague.*

our *Maistraili* or *North-West* Winds (as we used to have) which are the *Trade-Winds* in all the Hot Countries of the World, following the Course of the Sun. About Nine or Ten in the Morning these Winds begin to blow, and last till Sunset, when soon follow the Winds from the Shore, which blow till the next Day about Nine, and then the *Trade-Wind* retakes its Course.

The first *Infection* began in Houses near the Walls of the Town to the Land-ward, from whence the *East-Wind* blew, and by degrees crept towards the Sea ; but the Infection did not touch such Places which were inhabited by Merchants and Shopkeepers, who dealt in *Salt* and *Pickled Fish*, *Pitch*, *Tar*, and such like Commodities.

To the Northward of the Town, towards the Sea-Shore, lay very Boggy Stinking Ground. These *Marshes* commonly about Autumn cause *Agues* and *Fevers*, which may be from vast Swarms of invisible unwholesome *Insects*, which rise from thence at that Season, but of a different *Poison* from those which cause
the

The Cause of the Plague. 213

the *Plague*. So the like Places about *Civita-Vecchia*, *Scanderoon*, and I may mention the Isle of *Sheppy* likewise, seem to cause *Agues*. And it is observable, that from the Mouth of the River *Magra*, which divides *Tuscany* from *Liguria*, along the Sea-coast of *Italy*, as far as *Terracina*, is very Unhealthy and subject to *Agues* and *Pestilential Fevers*, being *Marshy Ground*.

We may also observe, that in *Turkey*, *Ægypt*, and *Barbary*, when the *Plague* rages, the *Franks*, the *English*, &c. are seldom infected with it, which seems to confirm my Opinion, that this *Sickness* proceeds from *Insects*, who having their certain Natural Nourishments respectively appointed them, do not in those Places infect Strangers, who have different Ways of Eating and Living from the Natives, and are of a contrary Nature of Body. It wou'd be well worth Enquiry, if the People of those Nations, that were in Strange Countries in the Times of *Pestilence*, were also free from *Infection*.

King CHARLES II. when he was told of the *Sickness* at *Leghorn*, said it must have
been

214 *The Cause of the Plague.*

been occasion'd by the *New Fortifications* which were then building in those *Marshy Places*. And 'tis very rational to believe, that turning those Unwholesome *Muds*, and exposing of them to the *Sun*, did much increase the *Distemper*, by infecting the *Air*, and filling it with greater Supplies of Poisonous *Insects*.

I cannot help taking Notice likewise of the raging *Distemper* which was among the *Cattle* about *London* about thirty Years ago. It was so violent and infectious, that if one *Cow* had it, all others that came within Scent of her, or eat where she graz'd, were sure to be infected. It seiz'd their Heads, and was attended with Running at the Nose and a very nauseous Breath, which kill'd them in three or four Days. The Herdsmen wou'd not allow it to be the *Murrain*, nor cou'd give any Account from whence it did proceed, or cou'd find out any Remedy against it. They only tell us, the unusual Dry *Summer*, and the continu'd *East-Winds*, were the Occasion of it. This *Distemper* had been for two or three Years before it came to us in *Lombardy*, *Holland*, and *Hamburgh*, to the

The Cause of the Plague. 215

the Loss almost of all their Cattle. The *States of Holland* caus'd a Medicine to be publish'd for the Good of those who had their *Cattle* thus distemper'd; but having been try'd here, it wou'd not cure one in seven, but rather increas'd the *Infection*, by keeping the Distemper'd *Cattle* longer alive (by some Days) than they wou'd have been without it. 'Tis remarkable that no *Oxen* had this *Distemper*, but only *Milch Cows*, which were more tender than the *Males*. The Herdsmen, to keep the *Cattle* from the *Infection*, let them blood in the Tail, and rub'd their Noses and Chops with *Tar*; and when any happen'd to die of it, they were burnt and buried deep under Ground. It began at *Islington*, spreading it self over many Places in *Middlesex* and in *Essex*; but did not reach so far Westward from *London* as twenty Miles.

The most general Opinion concerning the Cause of this *Distemper*, was, that the *Cattle* were first infected by drinking some unwholesome standing Water, where 'tis probable some poisonous *Insects* were lodg'd and bred; the *Summer* having been
extremely

216 *The Cause of the Plague.*

extremely Dry, attended almost constantly with *Easterly-Winds*, the Grass almost burnt up, and the Herbs of the Gardens almost destroy'd by the *Insects*; but such as they were (unfit for Table-use) were given to the *Cattle*. There was likewise so great want of *Water*, that many were forc'd to drive their *Cows* five or six Miles to it.

The *Electuary*, publish'd upon this Occasion by the *States of Holland*, was compos'd of most (if not all) the Drugs us'd in the most serviceable Medicines that were made use of against the *Plague* amongst Men; most of which Ingredients we know to be mortal to *Insects*, as strong-scented Roots and Herbs; but above all, Aromatic Gums and Saps of Plants, as *Rue*, *Garlic*, *Tar*, *Pitch*, *Frankincense* and *Olibanum*; but I believe, before all others, Extractions from the *Cedar*, nothing preserving Bodies from Worms better. These Ingredients are much us'd in *France* and *Italy*, to prevent or destroy Infection, by burning them, and Smoaking such Bodies, Letters, or any other Things as are brought from infected Places, after they have perform'd

The Cause of the Plague. 217

form'd *Quarentine*, and are not suffer'd to come on Shore till they have undergone this Operation.

It is not against Experience, that *Insects* can live and increase in Animal Bodies. How often do we find Men, Women and Children, troubled with *Worms*? What Varieties of those *Insects* are often voided by them? And how shou'd that be, if they were not either suck'd into the Stomach with the Breath, or taken into it with some unwholesome Food? For they cannot breed in such Bodies from nothing, without either their Eggs, or Themselves are brought thither by some Accident: For if they were the Natural Produce of Animal Bodies they wou'd then be alike common to all, which we know they are not.

I have been inform'd that in the Year 1714, when this *Mortality* among *Cows* was at its Height, that towards the End of the *Summer*, some Farmers bought in fresh *Cattle* and turn'd them into the same Fields where many *Cows* had died before, that they took the *Infection* and died likewise: But the following *Spring*, those Fields were void of Infection, and

E c

the

218 *The Cause of the Plague.*

the Cows that were put in did very well; but the Cows that were then put into the Cow-Houses (where the Sick Cows had been the Year before) were seiz'd with the *Distemper* and died. Which seems to inform us, that it was the effect of *Insects*, which thro' the Warmth of those Stalls were preserv'd from the Severity of the *Winter's-Frost*; but such as were left in the Open Fields, were destroy'd by the Cold. I have heard that a Woman about *Camberwell* cur'd six in seven of her Cows by giving them once a Week an Infusion of *Rue* and *Ale-wort*.

But it may be ask'd, Why these *Infectious Distempers*, subject to *Men, Cattle*, and *Plants*, are not Universal? And why the *Plague* shou'd not be as well in *India, China*, the South Parts of *Africa* and *America*, as in these Parts of the World? (For I do not know it has ever been in these Places). This Quære gives me a farther Opportunity to suggest, that *Insects* are the Cause of it, and that they are brought with the *Easterly-Winds*. In the first place, so far as I can learn; there is not Naturally in *America* any one kind
of

The Cause of the Plague. 219

of *Creature* or *Insect* that is found in any other Part of the World, and the *Plants* likewise are all different from those of other Countries; as it is the same in *India*, *China*, &c. whose Products are quite different from what we find elsewhere. Supposing then that these Pestiferous *Insects* are only the Produce of *Tartary*, let us consider to what Parts of the World they may be carried from thence with the *Easterly-Winds*; and whether *India*, *China*, the South of *Africa* and *America*, are not beyond their reach, or can reasonably be affected by them.

Whoever considers the Disposition of the Land and Water in the Globe, may thus account for the Passage of these *Insects*, with an *Easterly-Wind* from *Tartary* to all the Parts of *Europe*, *Asia-minor*, *Palestine*, *Barbary*, and other *South Coasts* of the Mediterranean Sea, whither, 'tis highly probable, they may come, without meeting any thing in their way to obstruct their Course.

The best Maps do not lay down any *Mountains* of Note between *Tartary* and the Places which have been subject to the

220 *The Cause of the Plague.*

Plague. The *Alps* run parallel with the *Winds* coming from *Tartary*, and therefore do not any way hinder their Passage : The *Mountains* of *Dalmatia* are not high enough to prevent the Passage ; or if they were, the *Caspian* Sea is sufficiently large to let them to the *South* Parts of *Europe*, the *Mediterranean* Sea, and the *North* Coasts of *Africa*, even to their most *Western* Bounds.

Now it may be expected perhaps by some, that these *Winds* shou'd yet continue their Progress as far as *America* ; but, as yet, (so far as I can learn) these *Land-Winds*, when they have blown with the greatest Force, and have been of the longest Continuance, have not reach'd farther than about 300 Leagues beyond the *Western* Coasts of *Europe*, which is a Trifle in comparison of the Vast *Ocean* between Us and *America*. Besides, 'tis my Opinion, that the *Winds* which blow over so vast a Tract of Land, as these *Tartarian* Winds must do, that I suppose convey and support the Pestiferous *Insects*, are of so different a Nature from the *Winds* coming from the *Ocean*, that 'tis likely those

The Cause of the Plague. 221

those Creatures which wou'd subsist in the one, wou'd be destroy'd by the other. So that if I am right in this Conjecture, *America* cannot be subject to the *Plague*.

Mount Atlas (which is a vast Ridge of Mountains, running from the *Ocean* almost as far as *Ægypt*, and are back'd with the Desarts of *Lybia*) may very likely obstruct the Passage of these *Insects* to the South of *Africa*; and for that Reason perhaps secure that Part of the World from *Plagues*. So likewise *Mount Caucasus*, or *Ararat*, which is one of the highest Ridge of Mountains in the World, running from East to West thro' *Persia* and *India*, may secure the *South* Parts of those Countries from the *Plague*, by stopping the Passage of those *Infectious Creatures*, if any Winds from *Tartary* shou'd happen to blow them that Way. And as *China* lies to the East of *Tartary*, so it must be *Westerly-Winds* which must infect that Country with the *Plague*, if it proceeds from what I imagine: But we do not yet find that *Westerly-Winds* are frequent in those Parts; or if they are, we may be assur'd they cannot blow at
the

the same time when the *Insects* are hatch'd and carry'd the contrary Way by the *Wind* from *Tartary*. We are inform'd, that upon the Coast of *China* the Winds are so regular, that from *October* to *March* they continually blow from the *North-East*; and from that Month to *October*, the direct contrary Way.

I shall conclude with LUCRETIUS'S
Opinion concerning the Cause of the
Plague, translated by Mr. CREECH,
p. 217.

NOW next I'll sing what Causes PLAGUES
create,
What drives a PESTILENCE, swoln big with Fate,
To waste, and lay a Nation desolate.

*I've prou'd, that numerous Vital Parts do fill
The Air, so likewise those that kill :
These Poisons (whether from the threatening Skies
Like Clouds they fall, or from the Earth arise,
When She's grown Putrid by the Rains, or sweats
Such noxious Vapours press'd by scorching Heats,)
Infect the Lower Air, and hence proceed
All raging PLAGUES, these all Diseases breed.*

*Thus often when one Country's Air is blown
Into another, and forsakes its own ;
It spoils the wholesome Air where e'er it goes,
And makes all like it self unfit for Us :*

Thence

The Cause of the Plague. 223

*Thence PLAGUES arise, and these descend and pass
Into our Fountains, tender Corn, or Grass,
Or other Food, or hang within the Air
Held up by fatal Wings, and threaten there ;
So whilst we think to Live and draw our Breath,
Those Parts must enter in, and following Death :
Thus PLAGUES do often seize the labouring Ox,
And raging Rots destroy our tender Flocks.
And thus the Thing's the same, if Winds do bear
From other Countries an unusual Air,
And fit to raise a PLAGUE, and Fever here,
Or if we travel all, and suck it there.*

The Learned Dr. MEAD in his excellent *Discourse concerning Pestilential Contagion*, printed in 1720. says, That Contagion is propagated by three Causes, the *Air, Diseased Persons, and Goods* transported from infected Places. The *Plague* (says he) is a real Poison, which being bred in the Eastern or Southern Parts of the World, maintains it self there by circulating from *Infected* Persons to Goods ; which is chiefly owing to the Negligence of the People in those Countries, who are stupidly careless in this Affair : That when the Constitution of the Air happens to favour Infection, it rages there with great Violence : That at that Time more especially

224 *The Cause of the Plague.*

cially Diseas'd Persons give it to one another, and *Contagious Matter* is lodg'd in Goods of a loose and soft Texture, which being pack'd up and carried into other Countries, let out, when open'd, the imprison'd Seeds of Contagion : And lastly, that the *Air* cannot diffuse and spread these to any great Distance, if Intercourse and Commerce with the Place infected be strictly prevented.

F I N I S.

